Qsan Controlled Print

Qsan user manual

Title: TrioNAS LX HA software user manual
Date: August 2015
Revision: 1.1.0

PROPRIETARY NOTE

This item is the property of Qsan, Inc., and contains confidential and trade secret information. This item may not be transferred from the custody of Qsan, Inc., except as authorized by Qsan, Inc. and then only by way of loan for limited purposes. It must not be reproduced in whole or in part and must be returned to Qsan, Inc. upon request and in all events upon completion of the purpose of the loan. Neither this item nor the information it contains may be used by or disclosed to persons not having a need for such use or disclosure consistent with the purpose to the loan without prior written consent of Qsan, Inc.

This document is approved for general use on the date indicated. The latest level is guaranteed to be current only on the date of retrieval from the repository. The user of this document is responsible for obtaining the correct version and removing obsolete copies from the workplace.

Copyright

Copyright@2004~2015, Qsan Technology, Inc. All rights reserved. No part of this document may be reproduced or transmitted without written permission from Qsan Technology, Inc.

Trademarks

All products and trade names used in this manual are trademarks or registered trademarks of their respective companies. Information is subject to change without notice.

0 Preface

About This Manual

This manual is the introduction of Qsan unified storage system and it aims to help users know the operations of the disk array system easily. Information contained in this manual has been reviewed for accuracy, but not for product warranty because of the various environments / OS / settings. Information and specification will be changed without further notice. For any update information, please visit www.QsanTechnology.com and your contact windows.

Before reading this manual, it assumes that you are familiar with computer skills such as hardware, storage concepts, and network technology. It also assumes you have basic knowledge of Redundant Array of Independent Disks (RAID), Storage Area Network (SAN), Network-Attached Storage (NAS), Internet SCSI (iSCSI), Serial-attached SCSI (SAS), Serial ATA (SATA), technology.

CAUTION:
Do not attempt to service, change, disassemble or upgrade the equipment's components by yourself. Doing so may violate your warranty and expose you to electric shock. Refer all servicing to authorized service personnel. Please always follow the instructions in this user's manual.

Technical Support

Thank you for using Qsan Technology, Inc. products; if you have any question, please e-mail to Support@QsanTechnology.com. We will answer your question as soon as possible.

Tips and Cautions

This manual uses the following symbols to draw attention to important safety and operational information.

Symbol	Meaning	Description
	TIP	Tips provide helpful information, guidelines, or suggestions for performing tasks more effectively.

©2015 Qsan Confidential. All rights reserved.

CAUTION Cautions indicate that failure to take a specified action could result in damage to the software or hardware.

Conventions

The following table describes the typographic conventions used in this manual.

Conventions	Description
Bold	Indicates text on a window, other than the window title, including menus, menu options, buttons, fields, and labels. Example: Click OK button.
<Italic>	Indicates a variable, which is a placeholder for actual text provided by the user or system. Example: copy <source-file> <target-file>.
[ ] square brackets	Indicates optional values. Example: [a | b] indicates that you can choose a, b, or nothing.
{ } braces	Indicates required or expected values. Example: { a | b } indicates that you must choose either a or b.
| vertical bar	Indicates that you have a choice between two or more options or arguments.
/ Slash	Indicates all options or arguments.
underline	Indicates the default value. Example: [a | b]

Legal Notice

All the features, functionality, and other product specifications are subject to change without prior notice or obligation. Information contained herein is subject to change without notice.

©2015 Qsan Confidential. All rights reserved.

Contents

Chapter 0 PREFACE 3
ABOUT THIS MANUAL 3
TECHNICAL SUPPORT 3
TIPS AND CAUTIONS 3
CONVENTIONS 4
LEGAL NOTICE 4

Chapter 1 GETTING STARTED 9
SUPPORTED OPERATING SYSTEMS 9
SUPPORTED BROWSERS 10
CONNECT TO TRIONAS LX U400HA/U600HA 10
Using Qfinder 11
Using LCM 12
NETWORK ENVIRONMENT 12
GETTING STARTED FOR THE VERY FIRST TIME – SETUP WIZARD 13

Chapter 2 STORAGE MANAGEMENT 15
PHYSICAL DISKS 15
STORAGE POOL 18
INSTANT READY & FAST REBUILD 21
SSD CACHING 21
VOLUMES 22
LUNS 26
THIN PROVISIONING 28
Decrease Volume size 29
COMPRESSION 29

Chapter 3 SYSTEM SETTINGS 31
GENERAL SETTING 31
System 31
System time 32
HIGH AVAILABILITY 33
Master/slave controller 33

©2015 Qsan Confidential. All rights reserved.

Controller failover/failback 34
Controller mode 35
Cluster IP 36
Active-active mode and ALUA support 38
How to verify active-active mode 39
Fail-safe network 40
NETWORK SETTING 40
General setting 40
Default gateway 44
DNS 45
IP filtering 45
POWER MANAGEMENT 46
UPS 46

Chapter 4 MANAGE SHARES, LUNS, AND DATA SERVICES 48

SHARE MANAGEMENT 48
Create shares 48
Manage shares 51
File Explorer 52
LUN MANAGEMENT 53
DATA SERVICES 54
CIFS service 54
NFS service 56
iSCSI service 56
LUN mapping management 58
CIFS AND WINDOWS 59
Method 1: The address input in Explorer 60
Method 2: The command line input from start button 60
Method 3: Map a network drive in Explorer 61
NFS AND LINUX 62
Redhat Linux 5 62
Redhat Linux 6 62
Open Solaris 10/11 62
NFS AND VSHPERE5 63
ISCSI AND WINDOWS ISCSI INITIATOR 63
Connect to iSCSI target 64
Check out iSCSI disks 65
Set MPIO 67

©2015 Qsan Confidential. All rights reserved.

Set MC/S 71
Disconnect iSCSI target 73
iSCSI AND LINUX iSCSI INITIATOR 74
Installation 74
How to use Linux iSCSI initiator 74
How to set up DM-Multipath 77
How to exclude local disks 77

Chapter 5 MANAGE USER, GROUP, AND DOMAIN 81
LOCAL ACCOUNT MANAGEMENT 81
Local user account 81
Local group account 83
UNIFIEDAUTH FUNCTION 84
ACTIVE DIRECTORY MANAGEMENT 85
LDAP MANAGEMENT 87
IMPORT / EXPORT ACCOUNT 89
ACCOUNT SPECIFICATION 90

Chapter 6 DATA PROTECTION – SNAPSHOT, REPLICATION, BACKUP 91
SNAPSHOT MANAGEMENT 91
Scheduled snapshot 94
REPLICATION MANAGEMENT 96
Remote replication 97
Local clone 100
CLOUD BACKUP – AMAZON S3 101
ANTIVIRUS FUNCTION 103

Chapter 7 SYSTEM MAINTENANCE AND MONITORING 105
DASHBOARD 105
Online connections 106
SYSTEM INFORMATION 108
FIRMWARE UPGRADE AND SYNCHRONIZATION 108
IMPORT / EXPORT 109
RESET TO FACTORY DEFAULT 109
REBOOT AND SHUTDOWN 110

Chapter 8 ADVANCED OPERATIONS 111
SERIAL CONSOLE CONNECTION 111
SECURE SHELL REMOTE CONNECTION 111

©2015 Qsan Confidential. All rights reserved.

CONSOLE UI 112

Chapter 9 GLOSSARY AND ACRONYM LIST 114

©2015 Qsan Confidential. All rights reserved.

1 Getting started

This software manual describes how to configure and manage TrioNAS LX dual controller NAS system, which includes U400HA and U600HA models. TrioNAS LX HA NAS is enterprise unified/hybrid storage for centralized file sharing applications, backup storage, and virtualization applications.

This chapter includes the following sections :
Supported operating systems
Supported browsers
Connect to TrioNAS LX U400HA/U600HA
Network environment

Supported operating systems

TrioNAS LX can act as a centralized file sharing center for heterogeneous clients running different operating systems. The supported operating systems are listed below for reference.

Windows
Windows 7 (SP1), Windows 8, Windows 8.1, Windows Server 2008, Windows Server 2008 R2, Windows Server 2012, Windows Server 2012 R2
(both x86 and x64)

Linux
Red Hat Enterprise Linux 5/6/7, CentOS 6.5/7.0, Ubuntu 13.04

Mac
Mac OS X 10.9 (Mavericks), 10.8(Mountain Lion)

Solaris
10 or later

VMware
vSphere ESXi 4/4.1/5.x/6.0

Citrix
XenServer 5/6

©2015 Qsan Confidential. All rights reserved.

Supported browsers

The management interface is provided through web browser only. The supported browsers are listed below for reference.

Google Chrome 28 or later
Microsoft Internet Explorer 9.0 or later
Mozilla Firefox 16 or later
Apple Safari 5.1.6 or later

	TIP	If you have difficulty or notice unexpected behavior with the browser, please try to use another Web browser to see if the issue can be resolved.

Connect to TrioNAS LX U400HA/U600HA

The management port of master controller will be set as dynamic IP address. Your network environment needs to have a DHCP server for IP assignment. IP address of the management port will be displayed on LCM screen as Fig 1-1 below. The administrator account is “admin” and the default password is “1234”.

Login account : admin
Admin’s password : 1234

Fig 1-1 LCM display (IP address)

The management port of this IP address is located at the IO panel of the “master” controller. Fig 1-2 below shows how to identify master controller and management port.

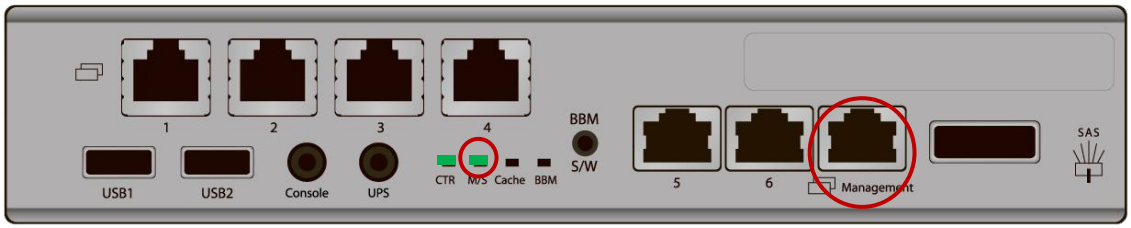
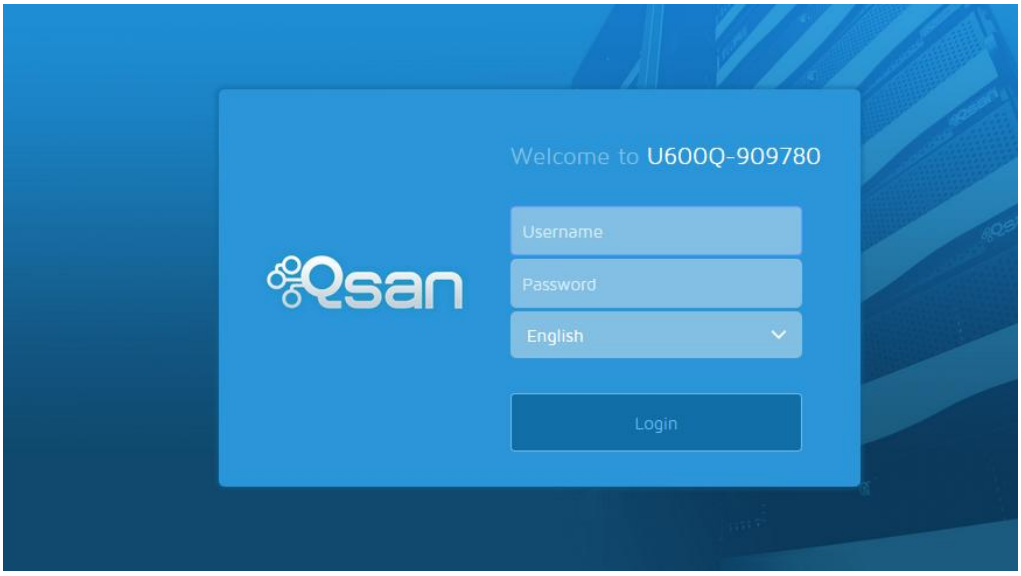


Fig 1-2 Master controller LED

©2015 Qsan Confidential. All rights reserved.

The M/S LED on the controller panel will lit as green. It means this controller is the master controller. Web UI service will only run on master controller. Network port to the far right labeled with “Management” is the management port.

Open a compatible browser and put in IP address of the management port in URL and the login web UI should pop up as the screenshot below.



Go to Configuration -> Network Configuration -> Network Setting to change the management port IP or other network ports to fit your network environment. Please be aware that all network ports (LAN1 ~ LAN6, management) can provide management interface. When the product is shipped out, all network ports use DHCP as default.

If you don’t have DHCP server in your network environment, all network ports support zero configuration function, which is the network port will assign an IP address to itself automatically as 169.254.xxx.xxx with network mask of 255.255.0.0. You may adjust you local computer’s IP setting to match this in order to connect to web management interface.

Using Qfinder

Qfinder is a handy Java tool to help locate Qsan storage systems on the same local area network. If you don’t want to use fixed IP of management port, please make sure there is DHCP server on the network. Connect LAN1 ~ LAN6 to the network switch. Run Qfinder and TrioNAS LX will be listed in Qfinder. Double click on the selected row and it will automatically connect TrioNAS LX using your default browser. Fig

©2015 Qsan Confidential. All rights reserved.

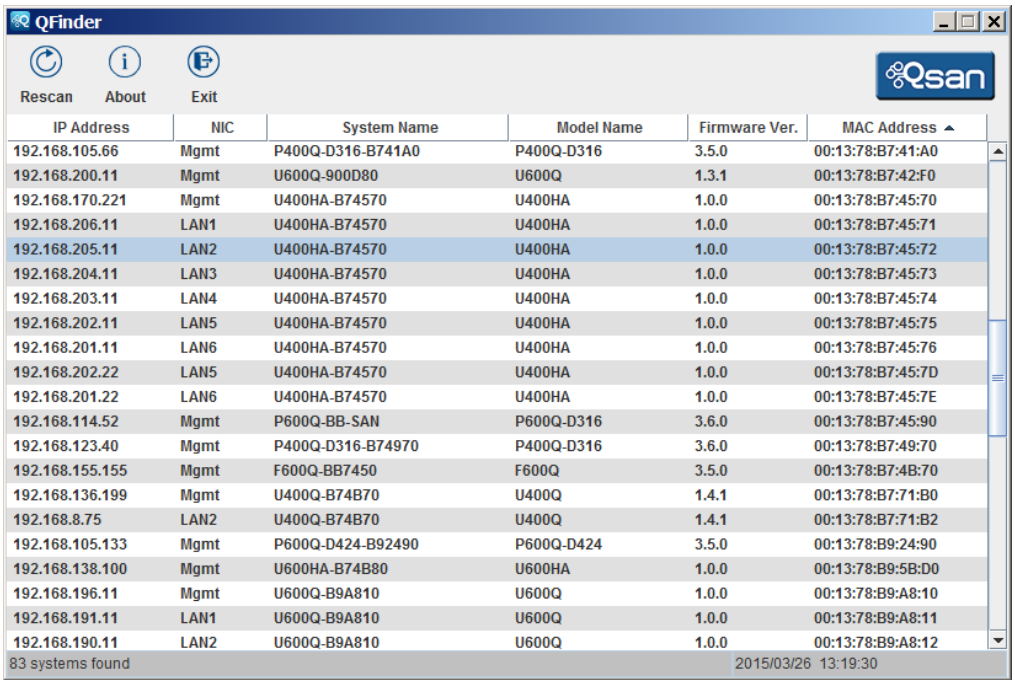


Fig 1-3 QFinder user interface

Using LCM

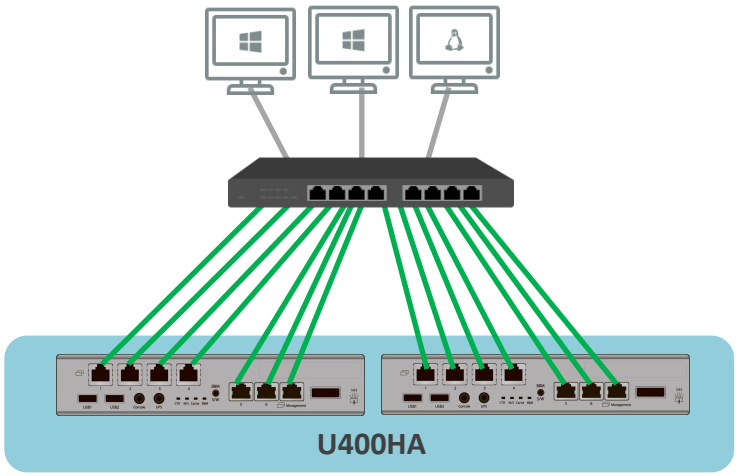
LCM on the enclosure front (Fig 1-1) will display the system name and IP address of the management port. You can adjust the management port IP using LCM buttons. Please follow LCM on-screen instructions to adjust the IP address.

Network environment

To fully capitalize the high availability functions provided by U400HA/U600HA, please make sure all the network ports (1GbE and 10GbE) are connected to the Ethernet switches.

Correct topology

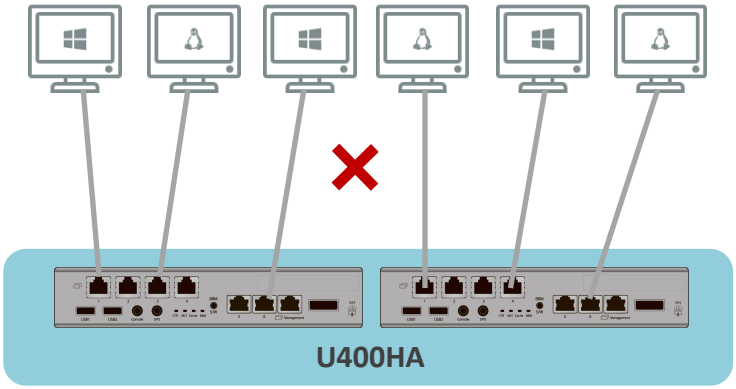
In order to utilize the high availability benefits provided by U400HA and U600HA, Ethernet switch is a necessity at installation stage. All high availability functions need Ethernet switches to function properly. Below is a simple example of a correct cabling topology.



©2015 Qsan Confidential. All rights reserved.

Wrong topology

Connecting hosts to U400HA or U600HA directly is a wrong way to do. You can still use U400HA and U600HA by point-to-point direct connection, but high availability functions such as controller failover/failback and fail-safe networking will not work at all. Below is a typical example of a wrong cabling topology.



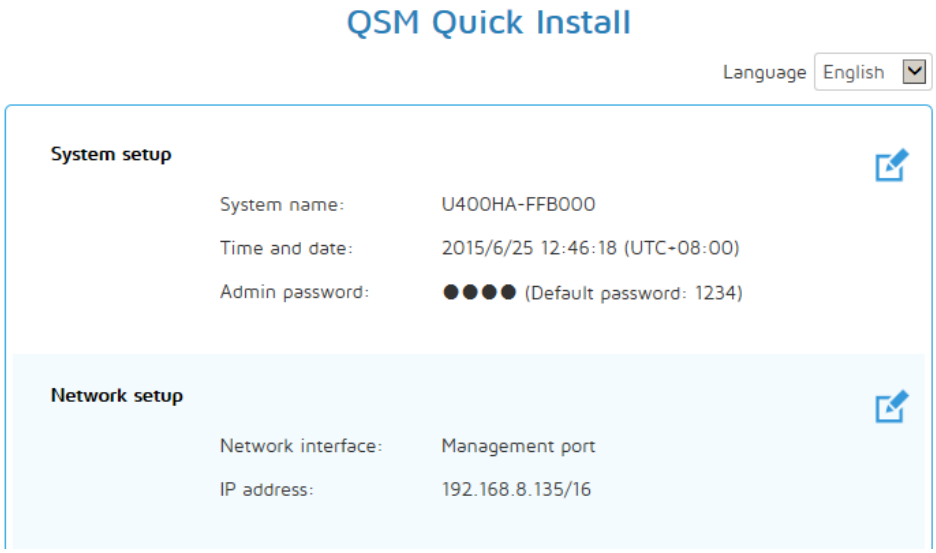
Getting started for the very first time – setup wizard

Turn on power to boot the NAS system. Booting process will take about 7 – 10 minutes. During booting, please wait until the slave controller is ready. The CTR LED will lit green when it's ready. When each controller is ready, the alarm will sound once. (so the alarm will sound the **second time** when the system is ready.)

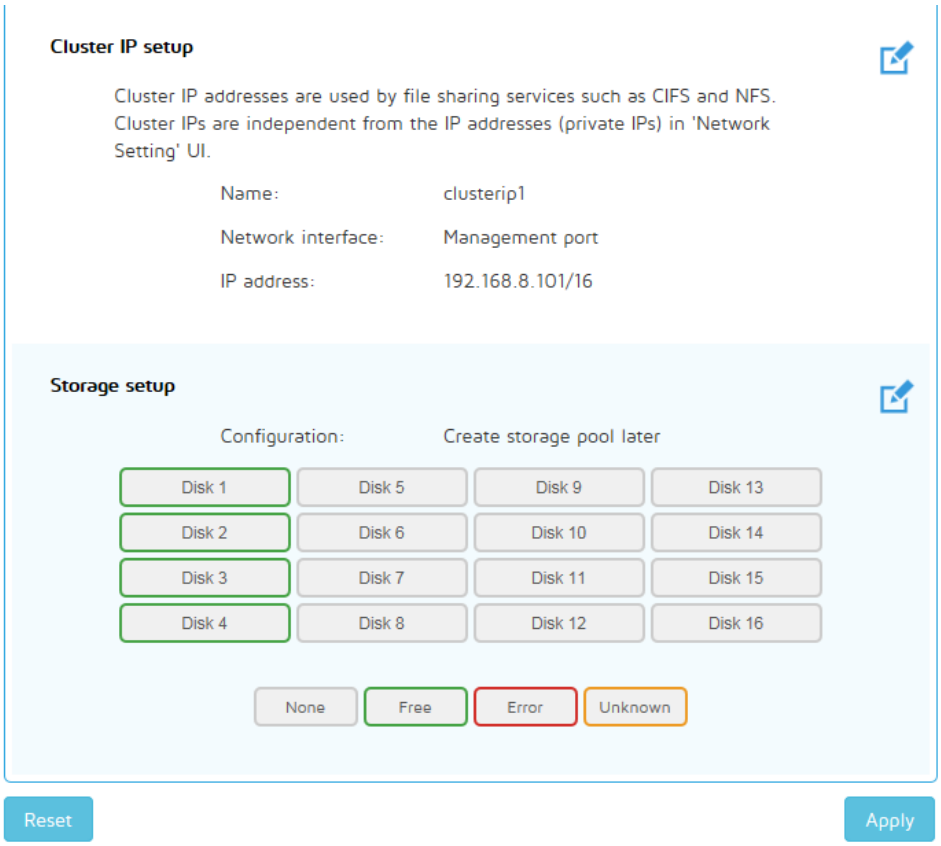
After you can connect to TrioNAS LX HA and get to the login screen, the setup wizard will guide you through the initial settings. The idea is to help you quickly get to use the powerful NAS system with minimum efforts. You can always change and modify the settings done in the setup wizard afterwards. This setup wizard will appear when all hard drives are free disks.

After login, you will see the following screen to set up the following items :

System, Network, Cluster IP, and Storage. Click on the upper right corner to enter each setup page for details.



©2015 Qsan Confidential. All rights reserved.



After each item is configured, click “Apply” to commit the changes and you can access the NAS through cluster IP now.

©2015 Qsan Confidential. All rights reserved.

2 Storage management

This chapter describes how to configure storage pool, volumes, and LUN. Storage efficiency functions such as thin provisioning and compression are explained as well. It contains the following sections.

- Physical disks
- Storage pools
- Instant ready & fast rebuild
- Volumes
- LUNs
- Thin provisioning
- Compression

Physical disks

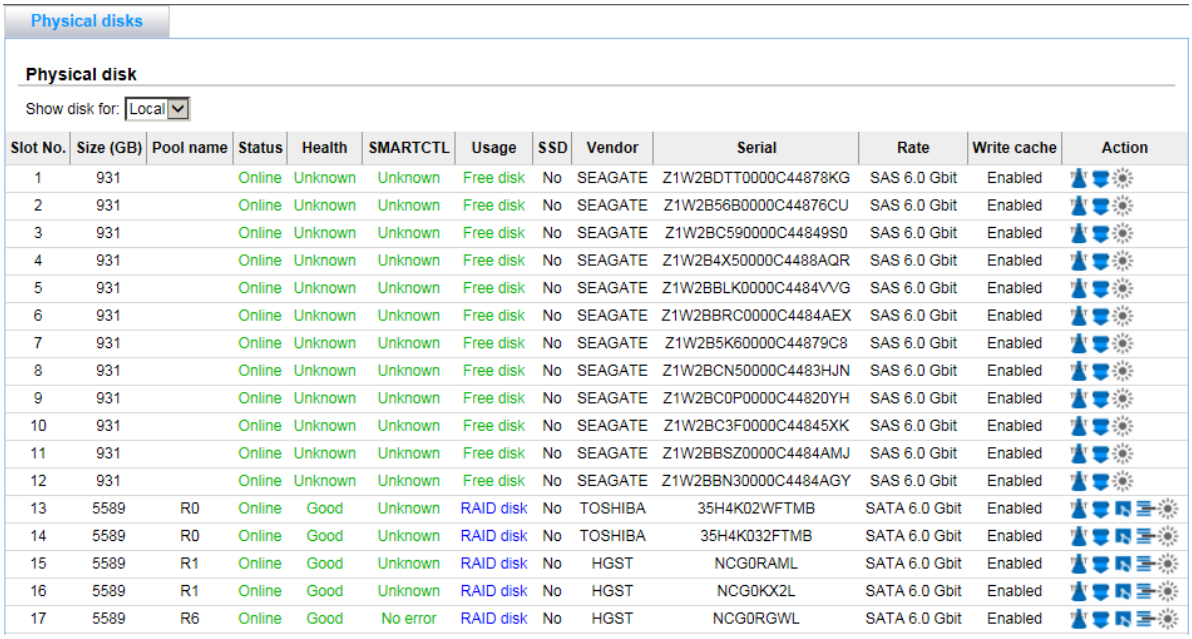
In this web UI page, all hard drive related information is displayed here. Please be aware that if you plan to use SATA drives, the MUX board is needed to provide the dual path function for dual controller mode because both controllers have to be able to access the same hard drive through independent circuit paths.

Fig 2-1 6Gb MUX board

If a SATA drive without MUX board is installed, it will NOT be recognized by TrioNAS LX HA system.

©2015 Qsan Confidential. All rights reserved.

Below is the hard drive table. The meaning of each column will be explained later. All applicable functions are grouped in the last column – Action.



Slot No.	Size (GB)	Pool name	Status	Health	SMARTCTL	Usage	SSD	Vendor	Serial	Rate	Write cache	Action
1	931		Online	Unknown	Unknown	Free disk	No	SEAGATE	Z1W2BDTT0000C44878KG	SAS 6.0 Gbit	Enabled	
2	931		Online	Unknown	Unknown	Free disk	No	SEAGATE	Z1W2B56B0000C44876CU	SAS 6.0 Gbit	Enabled	
3	931		Online	Unknown	Unknown	Free disk	No	SEAGATE	Z1W2BC590000C44849S0	SAS 6.0 Gbit	Enabled	
4	931		Online	Unknown	Unknown	Free disk	No	SEAGATE	Z1W2B4X50000C4488AQR	SAS 6.0 Gbit	Enabled	
5	931		Online	Unknown	Unknown	Free disk	No	SEAGATE	Z1W2BBLK0000C4484VVG	SAS 6.0 Gbit	Enabled	
6	931		Online	Unknown	Unknown	Free disk	No	SEAGATE	Z1W2BBRC0000C4484AEX	SAS 6.0 Gbit	Enabled	
7	931		Online	Unknown	Unknown	Free disk	No	SEAGATE	Z1W2B5K60000C44879C8	SAS 6.0 Gbit	Enabled	
8	931		Online	Unknown	Unknown	Free disk	No	SEAGATE	Z1W2BCN50000C4483HJN	SAS 6.0 Gbit	Enabled	
9	931		Online	Unknown	Unknown	Free disk	No	SEAGATE	Z1W2BC0P0000C44820YH	SAS 6.0 Gbit	Enabled	
10	931		Online	Unknown	Unknown	Free disk	No	SEAGATE	Z1W2BC3F0000C44845XK	SAS 6.0 Gbit	Enabled	
11	931		Online	Unknown	Unknown	Free disk	No	SEAGATE	Z1W2BBSZ0000C4484AMJ	SAS 6.0 Gbit	Enabled	
12	931		Online	Unknown	Unknown	Free disk	No	SEAGATE	Z1W2BBN30000C4484AGY	SAS 6.0 Gbit	Enabled	
13	5589	R0	Online	Good	Unknown	RAID disk	No	TOSHIBA	35H4K02WFTMB	SATA 6.0 Gbit	Enabled	
14	5589	R0	Online	Good	Unknown	RAID disk	No	TOSHIBA	35H4K032FTMB	SATA 6.0 Gbit	Enabled	
15	5589	R1	Online	Good	Unknown	RAID disk	No	HGST	NCG0RAML	SATA 6.0 Gbit	Enabled	
16	5589	R1	Online	Good	Unknown	RAID disk	No	HGST	NCG0KX2L	SATA 6.0 Gbit	Enabled	
17	5589	R6	Online	Good	No error	RAID disk	No	HGST	NCG0RGWL	SATA 6.0 Gbit	Enabled	

Column Name	Description
Slot No.	HDD slot number on the chassis.
Size (GB)	Capacity of hard drive.
Pool Name	This drive belongs to which storage pool.
Status	The status of the hard drive: Online: The hard drive is online. Rebuilding: The hard drive is being rebuilt. Degraded: One of the RAID set is at degraded mode. Failed: One of the RAID set is at failed mode. Importing: The system is loading data from the disks, which means the pool is not ready for use yet.
Health	The health of the hard drive: Good: The hard drive is good. Failed: The hard drive is failed. Error alert: S.M.A.R.T. error alerts. Read errors: The hard drive has unrecoverable read errors. Reserved: The disk is one of the member disks of a RAID group. It contains RAID group and pool information, but the original RAID group and pool can't be found. Either you put this disk at its original slot or set this disk as a free disk. Unknown : SAS drive doesn't support S.M.A.R.T. so it displays Unknown.
SMARTCTL	The S.M.A.R.T. status of the hard drive: Unknown: The S.M.A.R.T. of the hard drive is unknown. No error: The S.M.A.R.T. of the hard drive has no error.

©2015 Qsan Confidential. All rights reserved.

	Has error: The S.M.A.R.T. of the hard drive has error.
Usage	The usage of the hard drive: RAID disk: This hard drive has been set to a RAID group. Free disk: This hard drive is free for use. Dedicated spare: This hard drive has been set as dedicated spare of a pool. Reserved : There are RAID data on this disk. But other RAID member disks are missing. If this disk is no longer used for sure, it can be set as a free disk.
SSD	Drive type. It's either HDD (magnetic motor) or SSD (flash).
Vendor	Hard drive vendor.
Serial	Hard drive serial number.
Rate	Hard drive rate: SAS 6Gb/s. SAS 3Gb/s. SATA 6Gb/s. SATA 3Gb/s. SATA 1.5Gb/s.
Write cache	This is the cache buffer function on the hard drive. Enabled : write-back mode (faster) Disabled : write-through mode (slower) The default value is Enabled.
Action	All applicable functions are listed here. SMARTCTL self-test : this will run through a basic S.M.A.R.T. test tool and generate a log file to help you access the status of this particular drive. The drive needs to support S.M.A.R.T. in the first place. Download SMART log file. Set free disk. Use this function to set a Reserved disk to be a free disk. Replace disk. Replace this hard drive with another free disk. Turn on LED indicator. LED indicator is located on the HDD tray.

©2015 Qsan Confidential. All rights reserved.

Storage pool

TrioNAS LX HA adopts the most advanced 128bit file system ZFS. The fundamental structure is storage pool, which consists of at least one RAID group. The inter-relationships of hard drive, pool, share, and LUN are described in Fig 2-2 below.

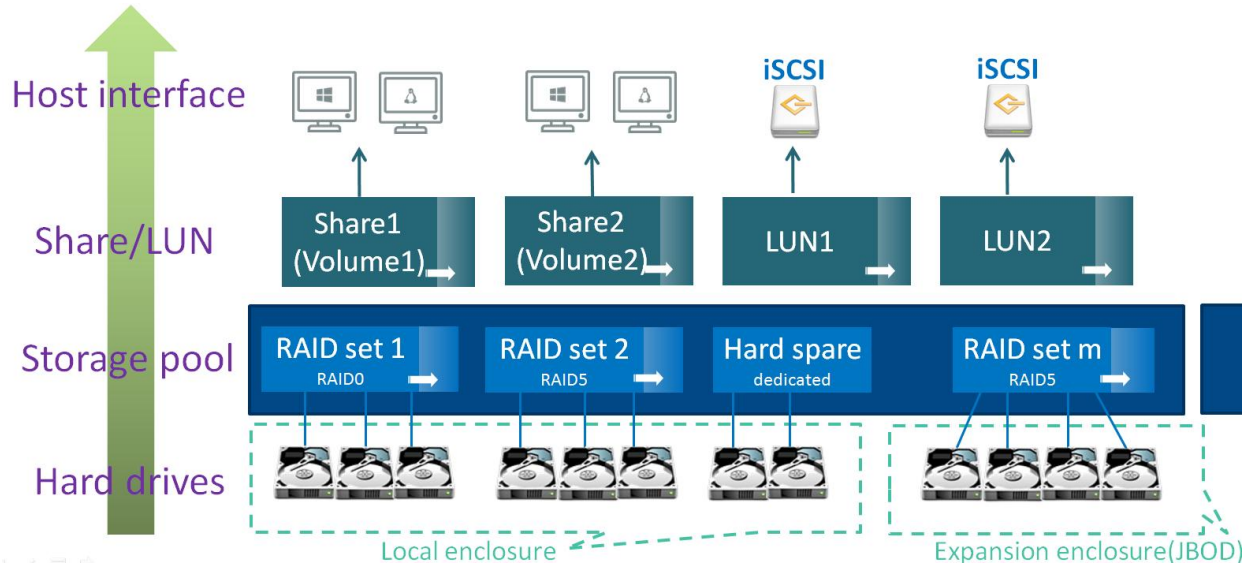


Fig 2-2 Storage structure

A storage pool consists of multiple RAID groups with different RAID levels. The capacity of a storage pool can be added online by demand without interrupting data access. The capacity is not allowed to shrink by removing RAID groups away from the storage pool as the data is striped across all RAID groups in the pool.

The disks of a RAIG group can come from different enclosures (local and JBOD). The RAID groups of a storage pool can come from different enclosures too. This provides the maximum flexibility for users to configure their disk assignment.

From the storage pool, you carve out storage space for shares and LUNs. Shares are used by file sharing services such as CIFS and NFS. LUNs are used by iSCSI targets. Because shares and LUNs come from the same storage pool, this can achieve maximum efficiency without wasting any capacity.

You start with creating a new pool. The UI looks like Fig 2-3 below.

Column name	Description
Pool name :	Give a name to the new pool. Alphanumeric letters are allowed.
RAID level :	From this drop-down list, select the RAID level you want. A brief description of the RAID level you selected will be displayed below for easy reference.
Pool owner :	Because TrioNAS LX HA supports active-active mode and ALUA (Asymmetric Logic Unit Assignment) function. Each pool

©2015 Qsan Confidential. All rights reserved.

	belongs to one of the controllers.
Set up home directory :	If the checkbox is checked, the home directory will be created in this pool.
Write cache :	The cache buffer in RAID controller. Enabled : write-back mode (faster) Disabled : write-through mode (slower)
Show disk for :	Select a different enclosure. You may select a JBOD enclosure here.

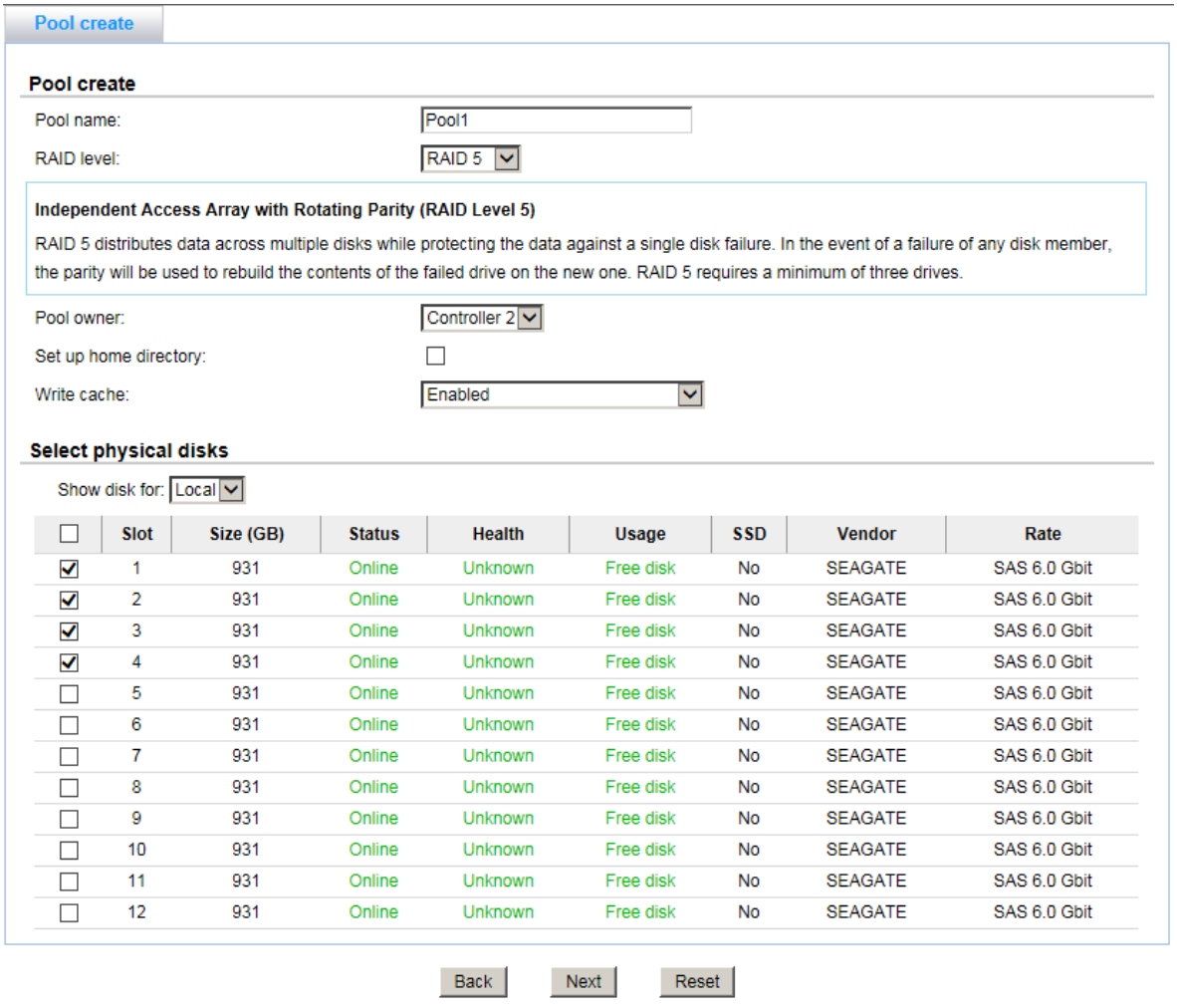
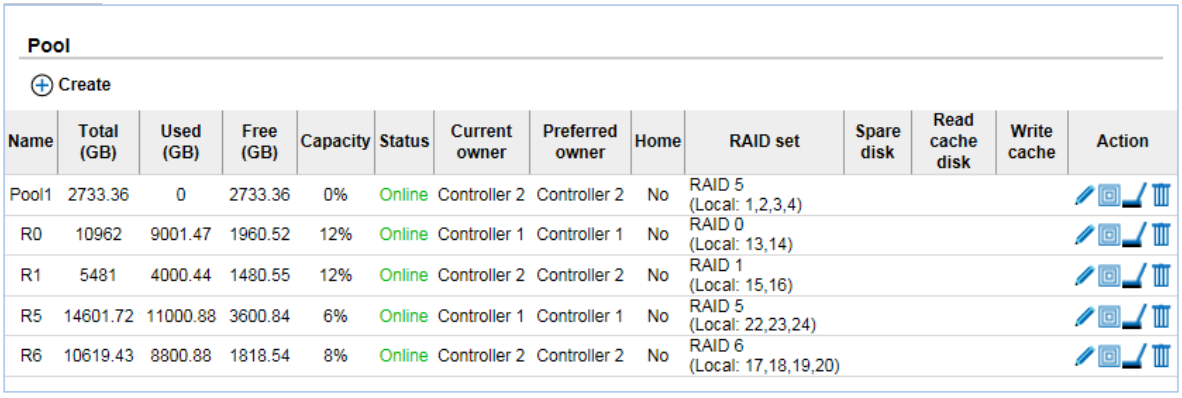

Pool create
Pool create
Pool name:
Pool1
RAID level:
RAID 5
Independent Access Array with Rotating Parity (RAID Level 5)
RAID 5 distributes data across multiple disks while protecting the data against a single disk failure. In the event of a failure of any disk member, the parity will be used to rebuild the contents of the failed drive on the new one. RAID 5 requires a minimum of three drives.
Pool owner:
Controller 2
Set up home directory:
Write cache:
Enabled
Select physical disks
Show disk for:
Local
Slot
Size (GB)
Status
Health
Usage
SSD
Vendor
Rate
1 931 Online Unknown Free disk No SEAGATE SAS 6.0 Gbit
2 931 Online Unknown Free disk No SEAGATE SAS 6.0 Gbit
3 931 Online Unknown Free disk No SEAGATE SAS 6.0 Gbit
4 931 Online Unknown Free disk No SEAGATE SAS 6.0 Gbit
5 931 Online Unknown Free disk No SEAGATE SAS 6.0 Gbit
6 931 Online Unknown Free disk No SEAGATE SAS 6.0 Gbit
7 931 Online Unknown Free disk No SEAGATE SAS 6.0 Gbit
8 931 Online Unknown Free disk No SEAGATE SAS 6.0 Gbit
9 931 Online Unknown Free disk No SEAGATE SAS 6.0 Gbit
10 931 Online Unknown Free disk No SEAGATE SAS 6.0 Gbit
11 931 Online Unknown Free disk No SEAGATE SAS 6.0 Gbit
12 931 Online Unknown Free disk No SEAGATE SAS 6.0 Gbit
Back
Next
Reset

Fig 2-3 Create a new pool

Use the checkboxes to select the required disks to make up the RAID group. Click Next to proceed. If settings are all correct. Click Apply to submit the request.

Go back to “Storage Management” -> “Pools” -> “General setting”. The newly created pool – “Pool1” is listed in the table. Fig 204 below shows the pool table content. The meaning of each column is explained below.

©2015 Qsan Confidential. All rights reserved.



Pool

Create

Name	Total (GB)	Used (GB)	Free (GB)	Capacity	Status	Current owner	Preferred owner	Home	RAID set	Spare disk	Read cache disk	Write cache	Action
Pool1	2733.36	0	2733.36	0%	Online	Controller 2	Controller 2	No	RAID 5 (Local: 1,2,3,4)				
R0	10962	9001.47	1960.52	12%	Online	Controller 1	Controller 1	No	RAID 0 (Local: 13,14)				
R1	5481	4000.44	1480.55	12%	Online	Controller 2	Controller 2	No	RAID 1 (Local: 15,16)				
R5	14601.72	11000.88	3600.84	6%	Online	Controller 1	Controller 1	No	RAID 5 (Local: 22,23,24)				
R6	10619.43	8800.88	1818.54	8%	Online	Controller 2	Controller 2	No	RAID 6 (Local: 17,18,19,20)				

Fig 2-4 Pool table

Column Name	Description
Name	Pool name.
Total (GB)	Total capacity of this pool.
Used (GB)	Used capacity of this pool.
Free (GB)	Free capacity of this pool.
Capacity	Used percentage
Dedup	The status of the deduplication. (This option is only visible when it supports deduplication.)
Status	The status of the pool: Online: the pool is good. Failed: the pool fails. Rebuild: the pool is being rebuilt.
Current owner	The pool belongs to which controller at the moment.
Preferred owner	If failback process is commencing, the pool will be assigned to the preferred owner.
Home	The home directory is in the pool. Yes: the home directory is in the pool. No: the home directory is not in the pool
RAID set slot	You can see how many RAID groups constitute this pool. RAID level and member disks of each RAID group will be displayed clearly.
Spare slot	This shows what disks are the dedicated spares for this pool.
Read cache	The SSD drives that are used as read cache (L2ARC).
Write cache	The SSD drives that are used as write cache (ZIL).
Action	Edit. This allows you change some attributes of the pool. Expand. This is the online expansion function. If the pool capacity is used up, use this function to add more RAID groups to expand the capacity without affecting data access. Scrub. This is so called resilvering function. It runs a series of tests to make sure the disks have no error. Delete. Delete the pool. The pool can be deleted when

©2015 Qsan Confidential. All rights reserved.

	there is no share or LUN in it except UserHome directory.

	TIP	The size of the storage pool can be expanded by adding more RAID groups, but it can NOT be shrunk by removing RAID groups.

Instant ready & fast rebuild

The beauty of ZFS file system is that no RAID initialization and formatting is needed unlike EXT3 and EXT4 file systems found in most NAS systems. Once the storage pool is created and ready, you may create volumes, turn volumes into shares, and start copying files right away without wasting time for RAID initialization and formatting. You may create LUNs and start using iSCSI LUNs in the same way too.

When RAID rebuilding is needed for replacing a new hard drive, rebuilding time is proportional to the size of the existing data stored on the RAID disks. For example, you use five 3TB hard drives to make a RAID5 storage pool. The size of overall data stored in this RAID5 is 200MB. If you rebuild one drive in this RAID5 storage pool, it will probably take tens of seconds to complete rebuilding instead of hours.

These wonderful functions make using TrioNAS LX HA tremendously easy and efficient.

SSD caching

TrioNAS LX HA supports SSD caching to leverage the benefits of SSD drives to boost random IOPS performance. This also makes TrioNAS LX HA a hybrid storage to combine SATA drives and SSD caching function to get a net performance results of a pure SAS storage pool.

SSD caching function is applied to the storage pool only. All volumes and LUNs in the same storage pool can benefit from this. There are two types of SSD caching – SSD read cache and SSD write cache. SSD read cache is also called L2ARC, which means level two ARC storage. It positions between RAM (ARC storage) and hard disks. SSD read cache is a MUST-HAVE when you use de-duplication to de-duplicate huge amount of data. The more the data being de-duplicated, the larger the de-duplication table (DDT) is. Frequent access to DDT will slow down the performance. Adding SSD read cache will allow the system to move DDT to SSD read cache to speed up de-duplication performance. The other type is SSD write cache. It is also called ZIL (ZFS Intent Log). It is helpful when synchronous write (write-through mode) is involved to boost the performance.

SSD read cache and SSD write cache are configured separately in Fig 2-5 below.

©2015 Qsan Confidential. All rights reserved.

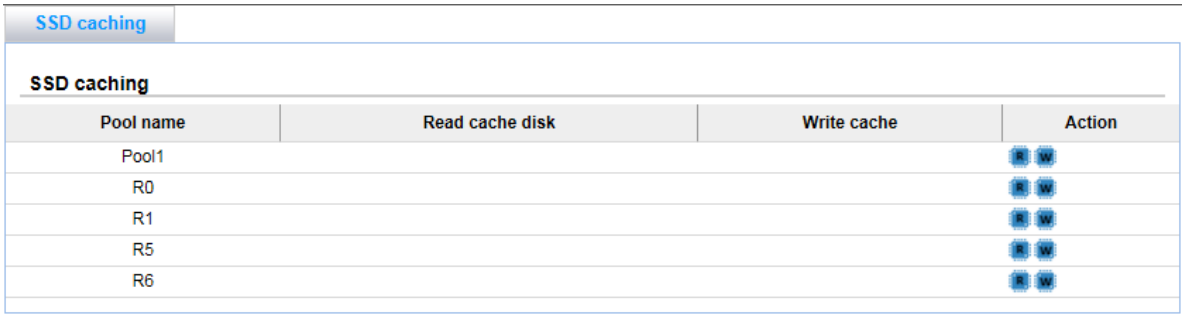


Fig 2-5 SSD cache table

Click to add SSD read cache.
Click to add SSD write cache.

Each storage pool has its own SSD read cache and SSD write cache. The maximum drive number for SSD read cache is four. The maximum drive number for SSD write cache is two. RAID 1 (mirror) is supported for SSD write cache to provide better data protection and high availability. However, there is no RAID protection in SSD read cache.

TIP:
Only SSD drives can be used as SSD cache, which includes read cache (L2ARC) and write cache (ZIL, ZFS Intent Log).

Volumes

"Volume" is where the end users store and access their files from heterogeneous operating systems such as Windows, Linux, Unix, and Mac. Data services relating to Volumes are CIFS(SMB) and NFS*. Network shares are created from these volumes by giving them share names.

Before you can create a network share, a volume needs to be created. Go to "Storage Management -> Volumes" page and click "Create". The meaning of each item in Fig 2-6 will be described below.

*AFP, FTP, and WebDAV services are coming soon in the near future.

©2015 Qsan Confidential. All rights reserved.

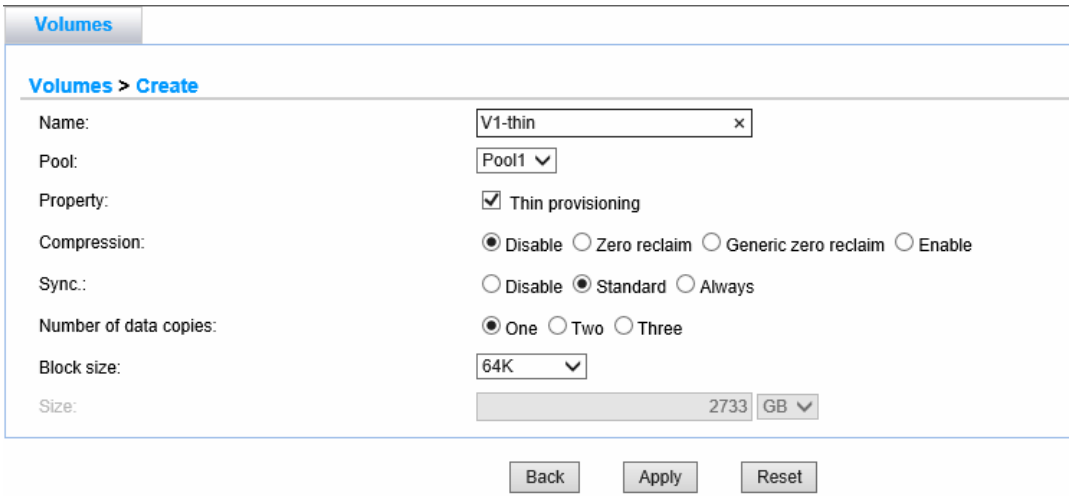


Fig 2-6 Create a Volume

Column Name	Description
Name	Volume name.
Pool	Use the drop-down list to select the pool you want to use.
Property	Thin provisioning. Use the check box to enable it. Deduplication. This will be provided in the near future.
Compression	Lossless compression function provides advanced storage efficiency function. Disabled: No compression at all. Default value. Zero Reclaim: When the data block contains all zeros, no physical space will be consumed. The block will be marked specifically. Generic Zero Reclaim: This is Qsan patent filing technology that will reclaim data blocks with special patterns such as all 0's, all 1's. Theoretically, it will have better storage efficiency. Enabled: This will always enable lossless data compression function using LZJB algorithm.
Sync	"Sync" means synchronous I/O, which is similar to the definition of write-through. Synchronous I/O is that every file system transaction is written and flushed to stable storage devices by a system call return. The application needs to wait for the physical data update completion before it could issue another command. Latency will be longer and performance will suffer. If you don't know how to use this setting, please leave it as "Standard. Disable : All write commands become asynchronous. It will ignore the synchronous transaction demands of applications such as database or NFS. Standard : The default value. It depends on the applications. Always : All write commands become synchronous even if the application issues asynchronous transactions.

©2015 Qsan Confidential. All rights reserved.

	The “Sync” option will be grey out in “LUNs” page. This is because synchronous write function is not supported in iSCSI block access for the time being.
Number of data copies	“Number of data copies” is used to create mirroring of data to avoid data corruption. When the original file corrupts, the NAS system will use the extra “copy” to recover the corrupt file. The value of two means that when you copy a 10MB file, it will take up 20MB space. The value of three means that it will take up extra double space to store the same data in the same storage pool. Users will not be able to see the actual extra copies. They are controlled by ZFS file system.
Block size	Block size of ZFS file system. If your application has a particular I/O access pattern, adjust this block size to match your application to gain the maximum performance.
Size	The allocated capacity of the volume. In Volume, this size means “Quota” as well as “Reserved space”. Put in a size you want for the volume. In Fig2-6, it is grey out because thin provisioning is checked. When thin provisioning is enabled, the size of the volume equals to the size of the pool’s remaining capacity.

After filling in everything, click “Apply” to create a new volume. The volume table will display all volumes the NAS system currently has. The meaning of each column is explained below.

Volumes

Create Delete

Name	Pool	Quota (GB)	Reserved (GB)	Used (GB)	Block size	Compression	Sync.	Copy #	Snapshot #	Schedule	Original	Action
V1-thin	Pool1	None	None	0	64K	Disabled	Standard	1	0	--	-	
R0-1	R0	2500	2500	4.6	64K	Enabled	Standard	3	143	Scheduled	-	
R0-2	R0	2500	2500	13.06	64K	Generic zero reclaim	Standard	3	142	Scheduled	-	
R0-5	R0	200	200	42.1	64K	Disabled	Standard	1	0	--	-	
R1-1	R1	1000	1000	2.82	64K	Enabled	Standard	3	95	Scheduled	-	
R1-2	R1	1000	1000	8.68	64K	Generic zero reclaim	Standard	3	94	Scheduled	-	
R1-5	R1	200	200	31.66	64K	Disabled	Standard	1	0	--	-	
R5-1	R5	3000	3000	4.72	64K	Enabled	Standard	3	143	Scheduled	-	
R5-2	R5	3000	3000	13.12	64K	Generic zero reclaim	Standard	3	142	Scheduled	-	
R5-5	R5	200	200	31.65	64K	Disabled	Standard	1	0	--	-	
R6-1	R6	2400	2400	3.38	64K	Enabled	Standard	3	95	Scheduled	-	
R6-2	R6	2400	2400	8.68	64K	Generic zero reclaim	Standard	3	94	Scheduled	-	
R6-5	R6	200	200	22.69	64K	Disabled	Standard	1	0	--	-	

Fig 2-7 Volume table

©2015 Qsan Confidential. All rights reserved.

Column Name	Description
Name	Volume name.
Pool	It shows which pool this volume belongs to.
Quota(GB)	The quota of the volume. This is the number of “Size” in Fig 2-6. “Quota(GB)” equals to “Reserved(GB)” as always. None : when thin provisioning is enabled, the reserved size will be displayed as None. To check the network drive capacity in Windows, it will display the remaining capacity of the pool and it is dynamically changing.
Reserved (GB)	The reserved size of the volume. This is the number of “Size” in Fig 2-6. “Reserved(GB)” equals to “Quota(GB)” as always. None : when thin provisioning is enabled, the reserved size will be displayed as None.
Used (GB)	The size of the data that is written to this volume.
Block size	Block size of ZFS file system.
Dedup	The status of deduplication. (This option is only visible when it supports deduplication.)
Compression	It shows which compression option is adopted.
Sync	It shows which sync option is adopted.
Copy #	It shows how many data copies will be made for this volume.
Snapshot #	The number represents how many snapshots are taken for this volume. Go to the snapshot management page to show all snapshots belonging to this volume.
Schedule	It shows if there are any scheduled tasks for this volume. Scheduled : There is at least one task. -- : No task.
Original	It shows the original volume of the snapshot clone. : This is not a volume clone.
Action	The available functions to this volume are listed here. Edit. This allows you change some attributes of this volume. Items that are allowed to change can be done on the fly during data access. Delete. Delete the volume.

Only “Volume” can be set as a share for file sharing purpose. Folders inside a Volume can NOT be used as shares.

The size of the volume can be increased if more space is needed by using Edit function. However, decreasing the volume size is not allowed to protect user data from deletion. (Please check “Thin provisioning section” for decreasing Volume size.)

©2015 Qsan Confidential. All rights reserved.

LUNs

LUN means Logic Unit Number, which is a block device addressed by SCSI protocol or SAN protocols such as Fibre Channel and iSCSI. In this section, we will explain how to create storage space as a block device.

Go to “Storage Management -> iSCSI -> LUNs”. Click “Create”. The meaning of each item in Fig 2-8 will be described below.

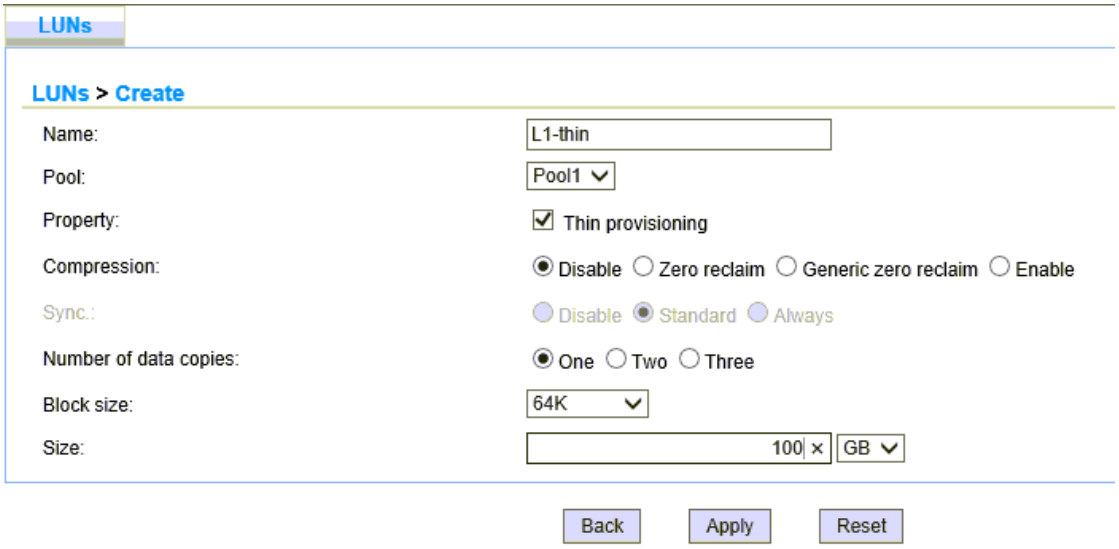


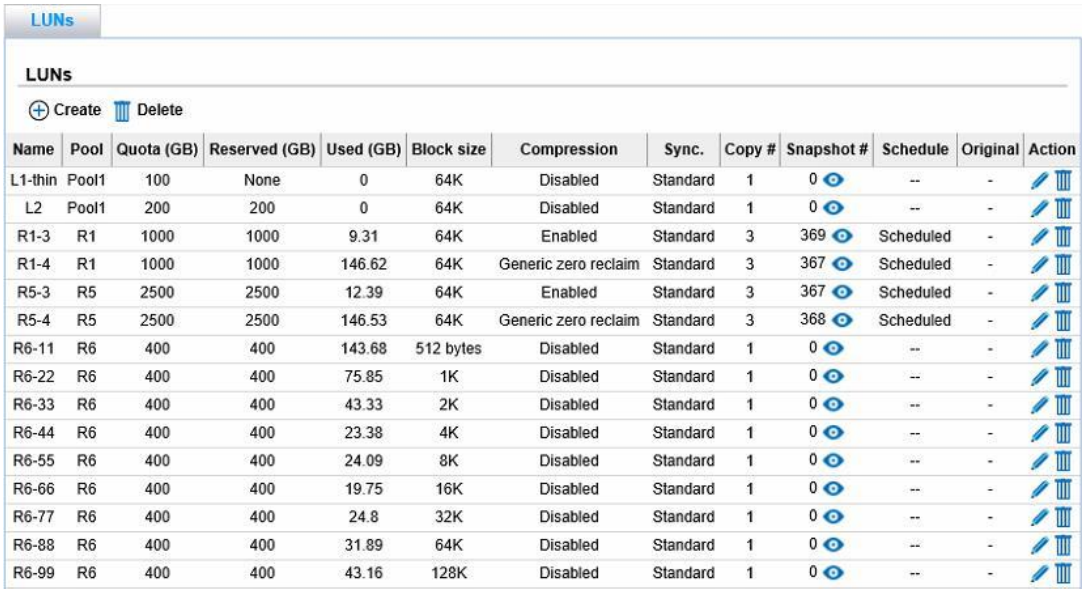
Fig 2-8 Create LUNs

Column Name	Description
Name	LUN name.
Pool	Use the drop-down list to select the pool you want to use.
Property	Thin provisioning. Use the check box to enable it. Deduplication. This will be provided in the near future.
Compression	Lossless compression function provides advanced storage efficiency function. Disabled: No compression at all. Default value. Zero Reclaim: When the data block contains all zeros, no physical space will be consumed. The block will be marked specifically. Generic Zero Reclaim: This is Qsan patent filing technology that will reclaim data blocks with special patterns such as all 0’s, all 1’s. Theoretically, it will have better storage efficiency. Enabled: This will always enable lossless data compression function using LZJB algorithm.
Sync	The “Sync” option will be grey out in “LUNs” page. This is because synchronous write function is not supported in iSCSI block access for the time being.

©2015 Qsan Confidential. All rights reserved.

Number of data copies	“Number of data copies” is used to create mirroring of data to avoid data corruption. When the original file corrupts, the NAS system will use the extra “copy” to recover the corrupt file. The value of two means that when you copy a 10MB file, it will take up 20MB space. The value of three means that it will take up extra double space to store the same data in the same storage pool. Users will not be able to see the actual extra copies. They are controlled by ZFS file system.
Block size	Block size of ZFS file system. If your application has a particular I/O access pattern, adjust this block size to match your application to gain the maximum performance.
Size	The allocated capacity of the LUN. This number is the “Quota(GB)” in Fig 2-9. A LUN must have a non-zero size. Put in a size you want for the LUN. In Fig2-8, it is NOT grey out even though thin provisioning is checked. The LUN will appear to the client operating system as if it has the allocated capacity. But in fact, only the size of the actual data (“Reserved(GB)”)is allocated dynamically by access requests.

After filling in everything, click “Apply” to create a new LUN. The LUN table will display all LUNs the NAS system currently has. The meaning of each column is explained below.



Name	Pool	Quota (GB)	Reserved (GB)	Used (GB)	Block size	Compression	Sync.	Copy #	Snapshot #	Schedule	Original	Action
L1-thin	Pool1	100	None	0	64K	Disabled	Standard	1	0	--	-	
L2	Pool1	200	200	0	64K	Disabled	Standard	1	0	--	-	
R1-3	R1	1000	1000	9.31	64K	Enabled	Standard	3	369	Scheduled	-	
R1-4	R1	1000	1000	146.62	64K	Generic zero reclaim	Standard	3	367	Scheduled	-	
R5-3	R5	2500	2500	12.39	64K	Enabled	Standard	3	367	Scheduled	-	
R5-4	R5	2500	2500	146.53	64K	Generic zero reclaim	Standard	3	368	Scheduled	-	
R6-11	R6	400	400	143.68	512 bytes	Disabled	Standard	1	0	--	-	
R6-22	R6	400	400	75.85	1K	Disabled	Standard	1	0	--	-	
R6-33	R6	400	400	43.33	2K	Disabled	Standard	1	0	--	-	
R6-44	R6	400	400	23.38	4K	Disabled	Standard	1	0	--	-	
R6-55	R6	400	400	24.09	8K	Disabled	Standard	1	0	--	-	
R6-66	R6	400	400	19.75	16K	Disabled	Standard	1	0	--	-	
R6-77	R6	400	400	24.8	32K	Disabled	Standard	1	0	--	-	
R6-88	R6	400	400	31.89	64K	Disabled	Standard	1	0	--	-	
R6-99	R6	400	400	43.16	128K	Disabled	Standard	1	0	--	-	

Fig 2-9 LUN table

Column Name	Description
Name	LUN name.

©2015 Qsan Confidential. All rights reserved.

Pool	It shows which pool this LUN belongs to.
Quota(GB)	The quota of the LUN. This is the number of "Size" in Fig 2-8. This equals to the number of "Size" in Create LUN page above.
Reserved (GB)	The reserved size of the LUN. If thin provisioning is disabled, this equals to Quota above. If thin provisioning is enabled, this equals to the allocated capacity. None : Because the LUN is just created with thin provisioning enabled, there is no allocated space.
Used (GB)	The size of the data that is written to this LUN.
Block size	Block size of ZFS file system.
Dedup	The status of deduplication. (This option is only visible when it supports deduplication.)
Compression	It shows which compression option is adopted.
Sync	It shows which sync option is adopted.
Copy #	It shows how many data copies will be made for this LUN.
Snapshot #	The number represents how many snapshots are taken for this LUN. Go to the snapshot management page to show all snapshots belonging to this LUN.
Schedule	It shows if there are any scheduled tasks for this LUN. Scheduled : There is at least one task. -- : No task.
Original	It shows the original LUN of the snapshot clone. : This is not a LUN clone.
Action	The available functions to this LUN are listed here. Edit. This allows you change some attributes of this LUN. Items that are allowed to change can be done on the fly during data access. Delete. Delete the LUN.

The size of the LUN can be increased if more space is needed by using Edit function. Like volume settings, decreasing the LUN size is not allowed in order to protect user data from deletion.

Thin provisioning

Thin provisioning is sometimes known as just-in-time capacity or over allocation. It provides storage space by requests and dynamically allocates space to store user data. Below are the benefits and characteristics of thin provisioning.

- Applied to both Volumes and LUNs.
- Remove stranded or reserved-but-unused capacity. Improve storage efficiency.
- It can be turned ON/OFF on the fly during I/O (using Edit function).

©2015 Qsan Confidential. All rights reserved.

Decrease Volume size

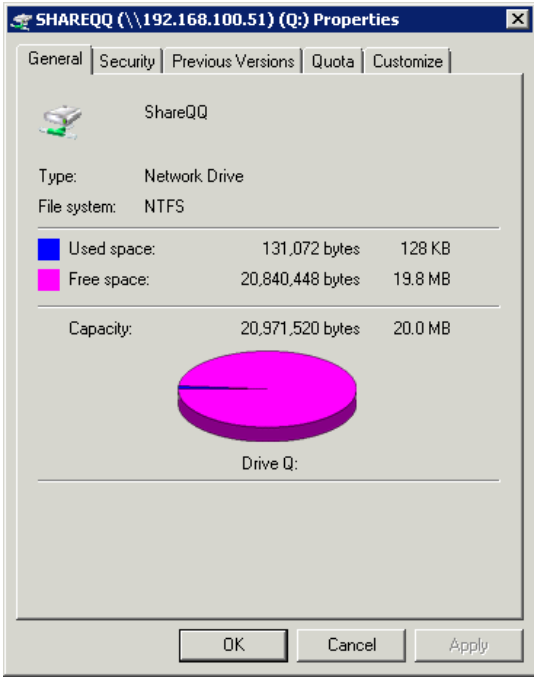
It is not allowed to decrease the size of a Volume or a LUN using "Edit" function. But there is a workaround to this. Because thin provisioning setting can be turned on/off on the fly, turn on the thin provisioning setting of the Volume first. The quota(GB) will become "None". Then use "Edit" function again to put in a smaller size and make sure the size you put in is larger than the size of Reserved(GB). Click "Apply" to commit the changes.

Compression

Compression algorithm adopted by TrioNAS LX HA is LZJB. It's a lossless and inline function, which means no data loss (NOT like JPG or GIF) and it takes place on the fly while data is written to the NAS storage. Below are the benefits and characteristics of compression.

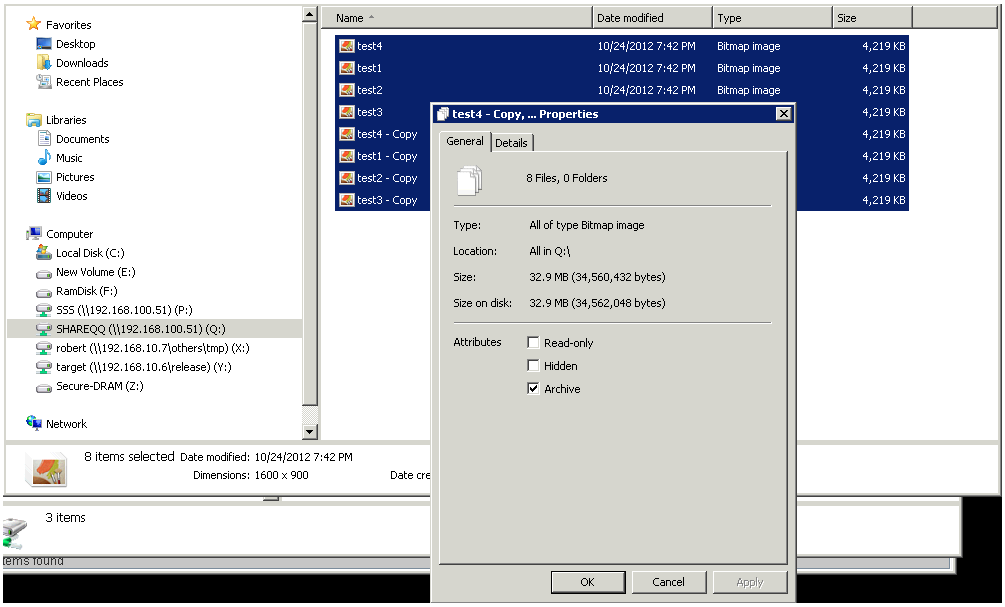
- Applied to both Volumes and LUNs.
- Save more storage space and improve storage efficiency.
- It can be turned ON and OFF on the fly during I/O (using Edit function).

How to use compression with shares?
For example, create a volume of 20MB with compression turned ON.
Map the share in Windows as a network drive. And check the drive property.

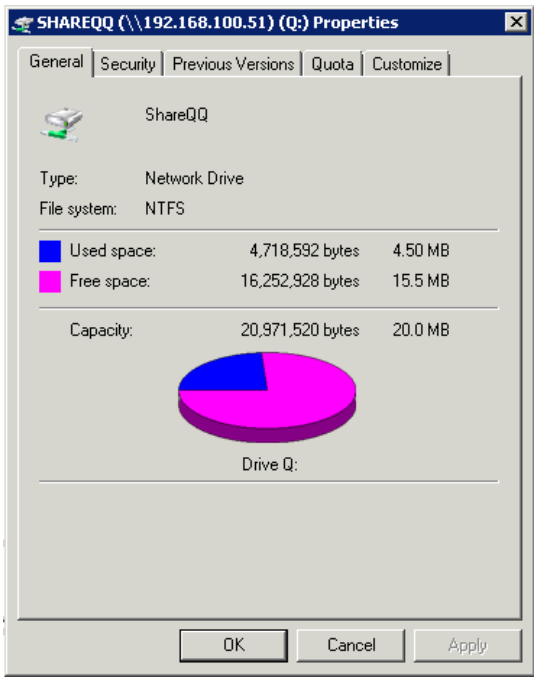


©2015 Qsan Confidential. All rights reserved.

Copy several bitmap files that are over the size of 20MB.



Check the network drive property again. The actual space taken is less than 20MB, which means **Compression** is functioning.



©2015 Qsan Confidential. All rights reserved.

3 System settings

This chapter describes how to configure the basic settings of the NAS system. It contains the following sections.

- General setting
- High availability setting
- Network setting
- Power management

General setting

This section is about some basic system administration settings such as system name, administrator password, web management, system time…etc.

System

Go to “General setting -> System”. Fig 3-1 shows the page content. The meaning of each item will be explained below.

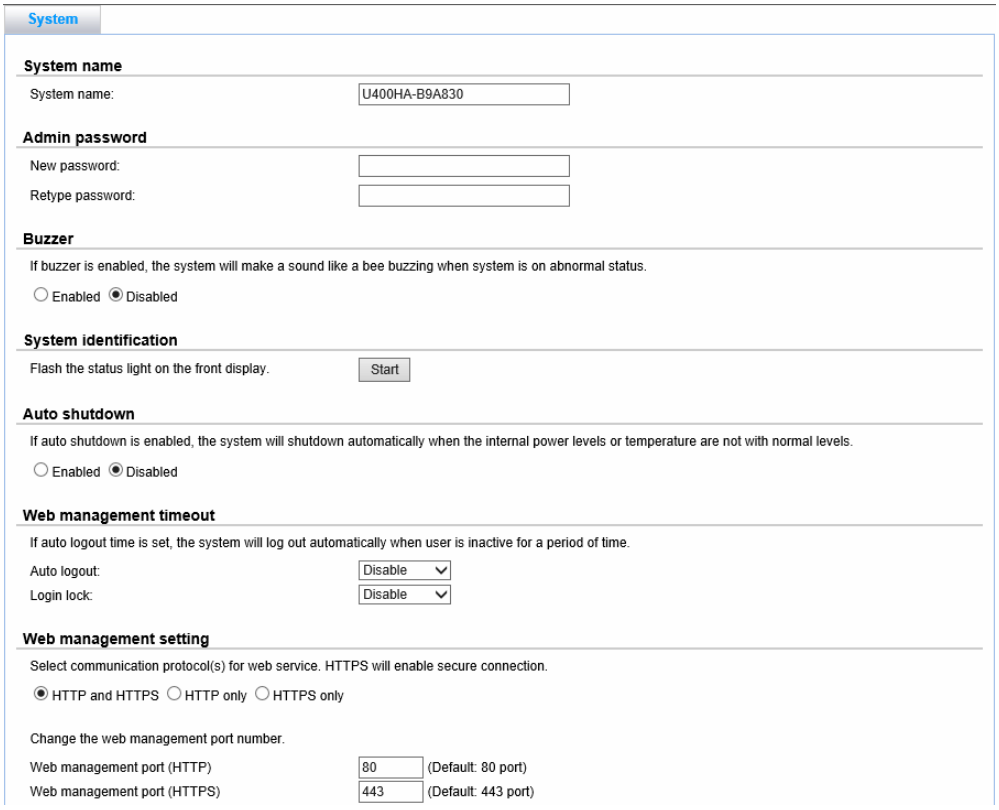

System
System name
System name:
U400HA-B9A830
Admin password
New password:
Retype password:
Buzzer
If buzzer is enabled, the system will make a sound like a bee buzzing when system is on abnormal status.
Enabled
Disabled
System identification
Flash the status light on the front display.
Start
Auto shutdown
If auto shutdown is enabled, the system will shutdown automatically when the internal power levels or temperature are not with normal levels.
Enabled
Disabled
Web management timeout
If auto logout time is set, the system will log out automatically when user is inactive for a period of time.
Auto logout:
Disable
Login lock:
Disable
Web management setting
Select communication protocol(s) for web service. HTTPS will enable secure connection.
HTTP and HTTPS
HTTP only
HTTPS only
Change the web management port number.
Web management port (HTTP)
80
(Default: 80 port)
Web management port (HTTPS)
443
(Default: 443 port)

Fig 3-1 General system setting

©2015 Qsan Confidential. All rights reserved.

Item name	Description
System name	NAS system name. This name can be used as UNC hostname to access NAS shares in Windows clients.
Admin password	Change administrator's password.
Buzzer	Enabled : When the system encounters abnormal event, the alarm will be turned on. Disabled : Turn the alarm off permanently.
System identification	Click the button to make the system indicator LED flash. Click again to stop it.
Auto shutdown	Enabled : When the system detects critical and abnormal situations such as voltage or temperature is out of normal range, the system will shut itself down automatically to avoid further possible damage to the system and user data. Disabled : The system will NOT shut itself down automatically.
Web management timeout	Auto logout : When the auto logout option is enabled, you will be logged out of the admin interface after the time specified. There are Disable (default), 5 minutes, 30 minutes and 1 hour options. Login lock : When the login lock is enabled, the system allows only one user to login to the web UI at a time. There are Disable (default) and Enable options.
Web management setting	If the default port numbers of HTTP and HTTPS are not allowed on the network, they can be changed here.

When it is done, click **Apply** to commit the changes.

System time

Go to "System setting -> General setting -> Time" to adjust the NAS system time. Fig 3-2 shows the system time page. The meaning of each item will be explained below.

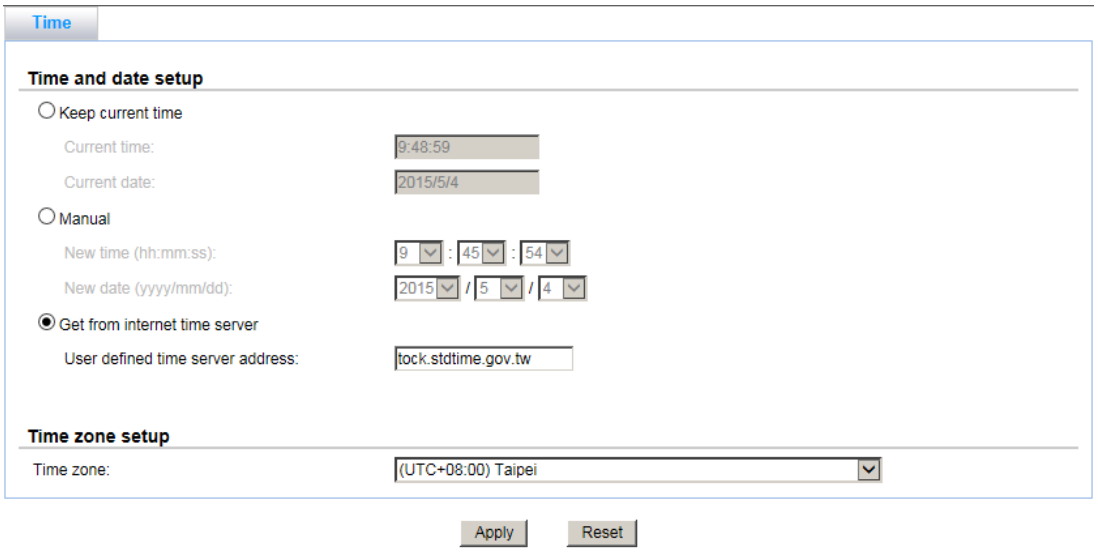


Fig 3-2 System time

©2015 Qsan Confidential. All rights reserved.

Item name	Description
Keep current time	Click the radio to use the available system time.
Manual	Click the radio to manually adjust the system time.
Get from Internet time server	Click radio button and enter the IP address of NTP (Network Time Protocol) server to synchronize the system time with a time server.
Time zone	Select the expected time zone. Daylight saving time will be adjusted automatically.

When it is done, click **Apply** button to commit the changes.

High availability

Qsan dual controller NAS is a two-node cluster design. Each RAID controller is a storage node. Data communications (heartbeat, write cache mirroring, command shipping, IO shipping…etc) between the two nodes are accomplished by the high bandwidth buses on the backplane. The system always runs in active-active mode by design and both RAID controllers can deliver data services at the same time to allow performance scale as well as capacity scale.

High availability consists of two parts – one is controller failover/failback, the other is fail-safe networking.

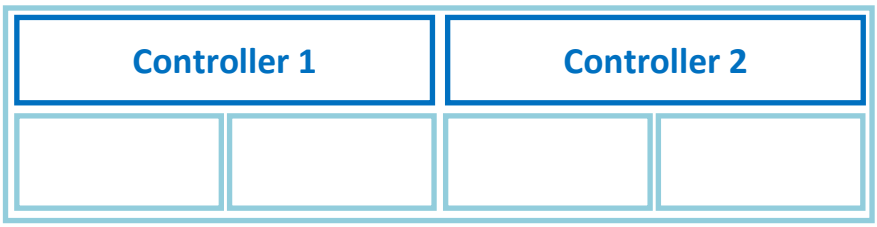
Master/slave controller

Even though TrioNAS LX HA is active-active architecture, mastership is still needed to be assigned to each controller to distinguish each other. Fig 1-1 shows you how to tell which one is master controller. The difference between master controller and slave controller is that the Web UI management service is running on the master controller. Other than that, both controllers are equal entities.

Aside from mastership, each controller has its own naming (controller1 and controller2) according to its slot position in the chassis. Controller1 doesn't necessarily mean master controller. Controller naming is used in Web UI management such as Dashboard, ownership … etc.

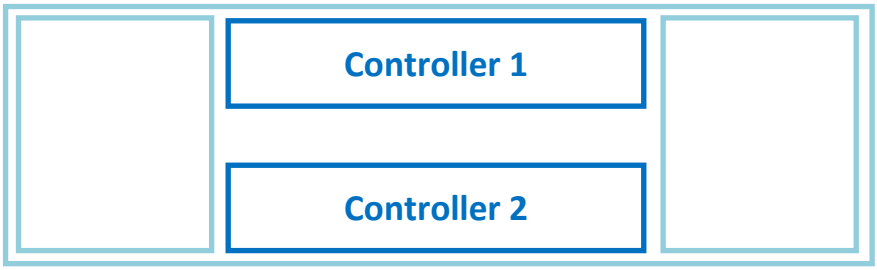
Graphs below shows how to get controller naming or you may refer to hardware user manual.

2U 12bay (rear look)

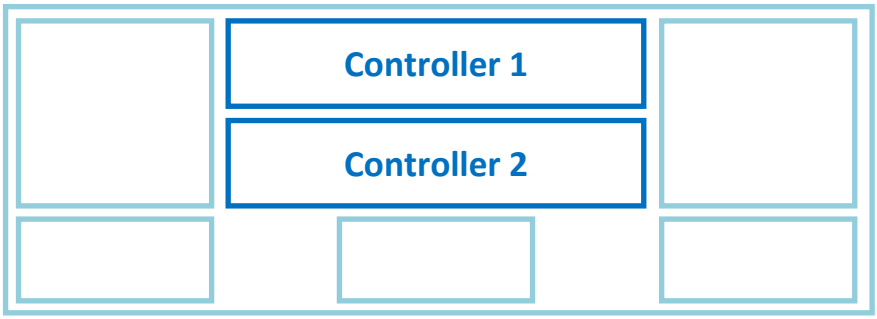


©2015 Qsan Confidential. All rights reserved.

3U 16bay (rear look)



4U 24bay (rear look)



Controller failover/failback

If one of the controllers fails due to hardware or software difficulties, the peer controller will take over all the I/O tasks that are currently running on the failed controller. The pool ownership will be transferred to the peer controller. When this happens, it is transparent to the end users. With Qsan in-house technology, failover time is less than 20 seconds. With less than 100 LUNs and 100 shares, the failover time is around 30 seconds. This ensures that almost all applications can keep running without any interruption to maintain the highest standard of business continuity.

The high availability function is implemented as default in the firmware (QSM operating system). So there is no specific web UI page to turn ON/OFF this function.

However, for controller failback, there are options available to set depending on user preference. This gives IT administrators more flexibility to arrange preparation for system recovery. Fig 3-3 below shows the failback mode page.

©2015 Qsan Confidential. All rights reserved.

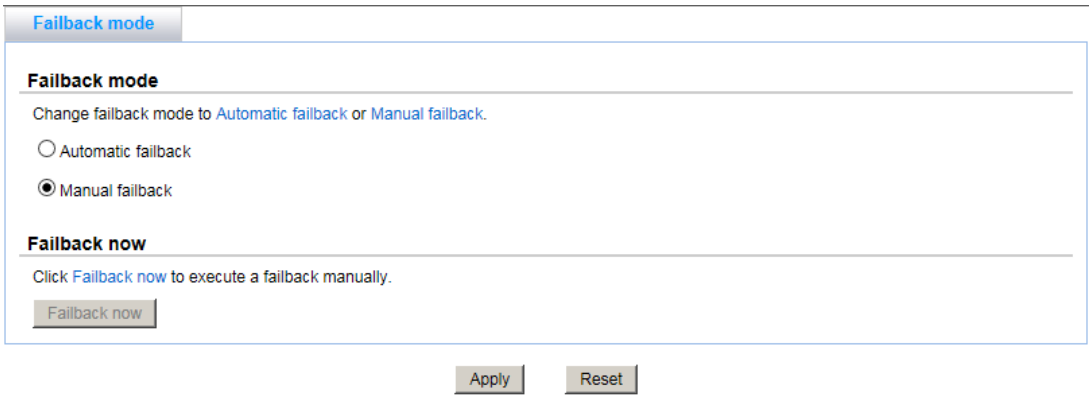


Fig 3-3 Failback mode

Item name	Description
Automatic failback	When the second controller is plugged in and boots successfully, the NAS system will perform controller failback automatically Failback now button is grey out.
Manual failback	When the second controller is plugged in and boots successfully, the NAS system will NOT perform controller failback until the administrator clicks “Failback now” button.
Failback now	When failback mode is set as manual, click this button when you want to perform failback process at the moment.

Controller mode

This function is designed to help upgrade from single controller system to dual controller system. Currently, the upgrade process is manual and please check the SOP (Standard Operation Procedure) document before performing the upgrade.

There are two controller modes – dual and single. This controller mode is stored on the EEPROM on the backplane board. When the mode is single, even if you plug in two correct controllers, the slave controller will be locked down. When the mode is set as dual, it is not allowed to change the mode again. It will be grey out as Fig 3-4. It is because TrioNAS LX HA will always run in dual mode.

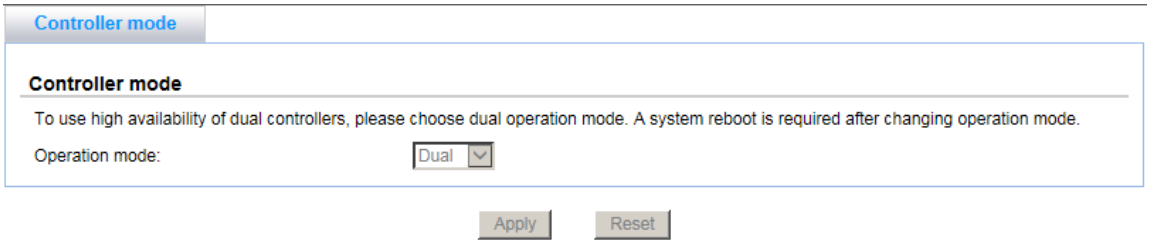

Controller mode
Controller mode
To use high availability of dual controllers, please choose dual operation mode. A system reboot is required after changing operation mode.
Operation mode:
Dual
Apply
Reset

Fig 3-4 Controller mode

©2015 Qsan Confidential. All rights reserved.

Cluster IP

This is probably the most distinctive feature in TrioNAS LX HA. There are two kinds of IP addresses in TrioNAS LX HA. They are private IP address and cluster IP address. Their usage is different. The main purpose of cluster IP is to provide redundant network paths for high availability. Currently there is no load balance implementing on these redundant network paths.

	Data service
Cluster IP	CIFS, NFS (file sharing services)
Private IP	iSCSI , web UI management

Private IP addresses are those network settings in “System setting -> Network -> General setting” in the next section.

Below are some rules about cluster IP.

1. Cluster IP and private IP of the same network interface can NOT be the same.
2. Cluster IP consists of mirrored network interfaces from each controller.
3. File sharing services (CIFS, NFS) are provided through cluster IP. Without cluster IP, shares CAN NOT be accessed by users.
4. Cluster IP can work even the private IP address of the network interface is unavailable.
5. Cluster IP doesn’t provide web UI management service. Private IP does.
6. Which redundant path will carry data is determined dynamically by the NAS operating system.

Go to “High availability setting -> Cluster IP setting” and click “Create”. Fig 3-5 below shows the cluster IP page. The meaning of each item will be explained below.

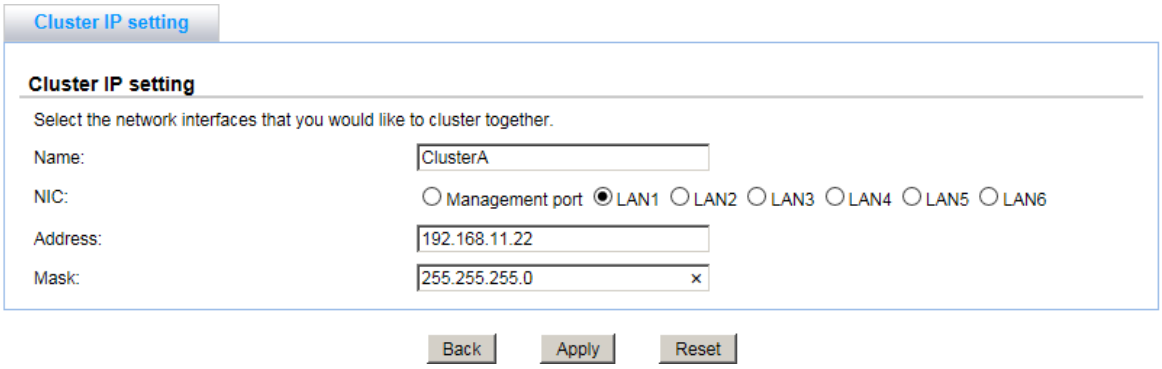


Fig 3-5 Create cluster IP

Item name	Description
Name	Put in a name for the cluster IP.
NIC	Available network interfaces. Link aggregation is counted as individual network interface.

©2015 Qsan Confidential. All rights reserved.

Address	IPv4 address for cluster IP. (IPv6 is not supported)
Mask	Subnet mask.

Network interfaces from both controllers are mirrored. A Cluster IP consists of mirrored network interfaces from each controller. This is to simplify failover process and allow quick debugging to identify and trace possible problems. At the same time, this design grants users the maximum flexibility to configure the network bandwidth and settings.

Assume we make LAN1 and LAN6 into a link aggregation – LAG1, and make LAN3 and LAN4 into a link aggregation – LAG3. The Create page will look like Fig 3-6.

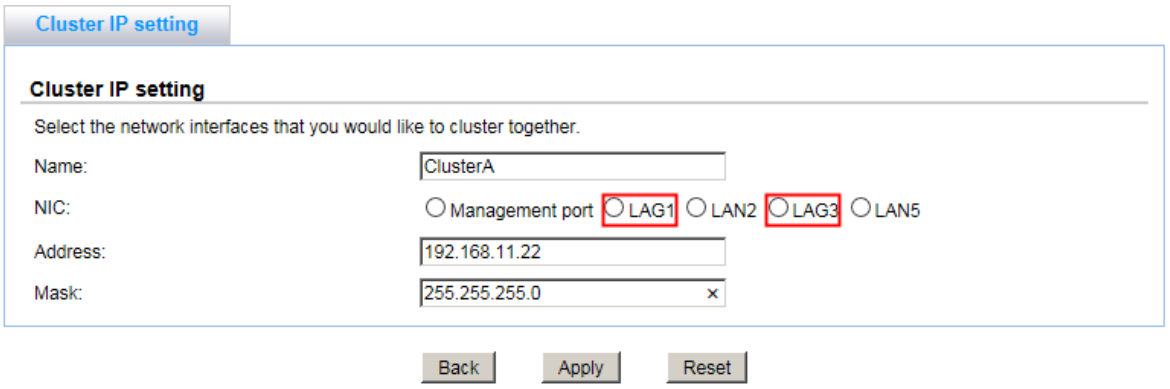


Fig 3-6 Create Cluster IP with LAG

Fig 3-7 below is the diagram to show the mirroring concept. Network ports with the same color join to form a cluster IP.

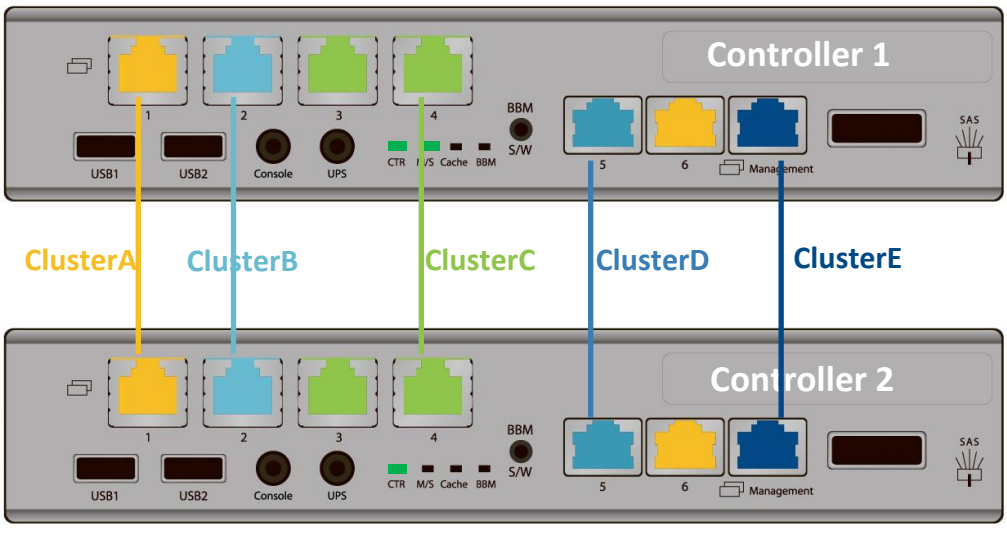


Fig 3-7 Mirrored design for cluster

©2015 Qsan Confidential. All rights reserved.

Fig 3-8 shows the cluster IP table. The meaning of each item will be explained below.

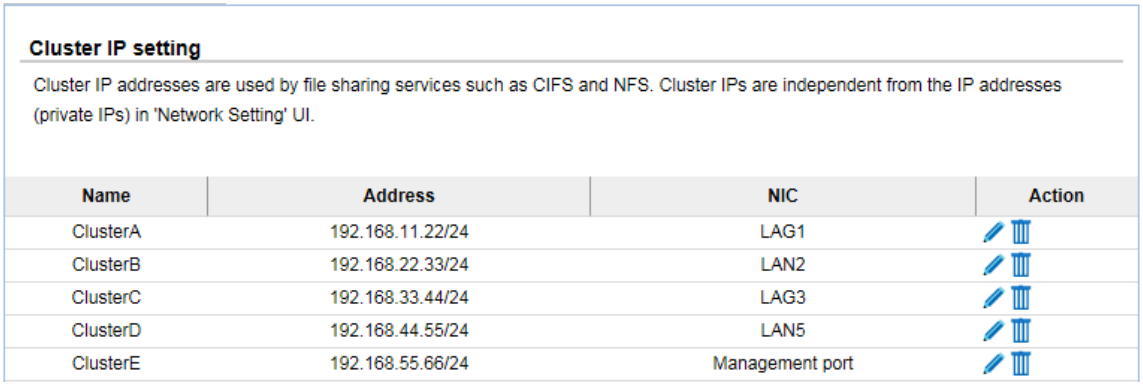


Fig 3-8 Cluster IP table

Item name	Description
Name	Name of the cluster IP.
Address	Cluster IP
NIC	Which network interface makes up the cluster IP.
Action	Available functions to the cluster IP. Edit. This allows you change the settings of the cluster IP. It will take effect immediately. Delete. Delete the cluster IP.

Please go to Chapter 4 to learn more about how to use CIFS and NFS services through cluster IP.

CAUTION:
Which redundant path of the cluster IP will actually transmit data is not configurable and is determined dynamically by the NAS operating system – QSM. To set the actual data path needs to be done manually by unplugging the cable(s) of the corresponding network interface.

Active-active mode and ALUA support

TrioNAS LX HA operates in full active-active mode by design. Both controllers can deliver data I/O at the same time. Active-active mode is more powerful and efficient than active-standby mode because no hardware resources are wasted to sit there idle. Command shipping and I/O shipping functions are implemented to support ALUA (Asymmetric Logic Unit Assignment) capability. Fig 3-9 below shows the general concept of how ALUA is supported.

©2015 Qsan Confidential. All rights reserved.

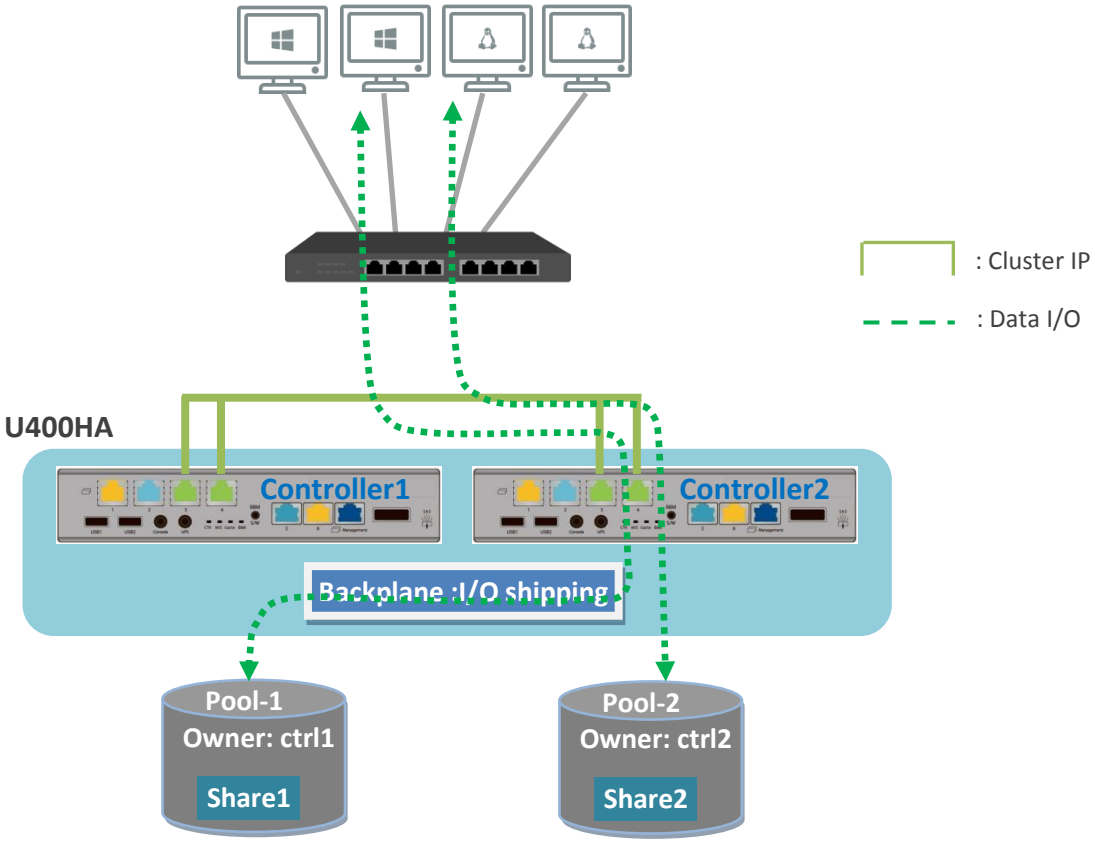


Fig 3-9 Active-active mode and ALUA support

Assume that the cluster IP in Fig 3-9 takes I/O path in controller2. Clients can use this cluster IP to access both share1 and share2 at the same time. To access share2, it is straight I/O because ownership and I/O path are the same – controller2. However, clients can access share1 as well. When controller2 receives this command and finds that the owner is controller1, controller2 will ship this I/O request to controller1 for processing. Controller1 will access share1, get the requested data, and send data back to controller2 through backplane. Controller2 will return the data to the clients that issue the I/O request to share1.

Regarding ownership information, please check Fig 2-4 about “current owner” attribute.

How to verify active-active mode

Use the following two simple ways to verify that both controllers can provide data services at the same time.

1. Assign a pool to each controller. Make a CIFS share on both pools. Create one cluster IP for accessing both shares.
   Generate continuous workload to both shares using the same cluster IP. Check the network performance meters in Dashboard to decide that I/O path goes through which controller. If the ownership of the share does NOT match the

©2015 Qsan Confidential. All rights reserved.

ownership of the network port where I/O goes through, this means that I/O shipping is happening and the other controller is serving the I/O requests

2. Assign a pool to each controller. Create a LUN on both pools. Connect to both LUNs using iSCSI. Make continuous workload to both LUNs.

Fail-safe network

Instead of controller failure, any component along the data I/O path from client network port, network cable, network switch, to network port on NAS system could be a failure point that causes disconnection. TrioNAS LX HA provides extended high availability to protect against switch port failure, controller port failure, and cable failure between controller and switch. Fig 3-10 below shows the scenarios where fail-safe network function will kick in to provide high availability protection.

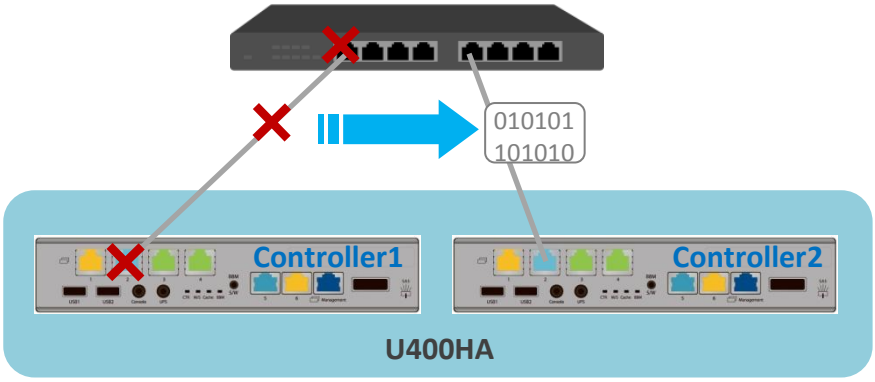


Fig 3-10 Fail-safe networking

When TrioNAS LX HA detects any failure in Fig 3-10, the I/O path of the cluster IP will automatically fail over to the other path. The failover time is much faster than that of controller failover. There is no web UI setting for this function. It is built-in by design in QSM operating system.

Network setting

This web page is where you adjust the management port setting and all private IP settings.

General setting

Fig 3-11 below shows the general settings for LAN. All these IP addresses are private IP. The meaning of each item is explained below.

©2015 Qsan Confidential. All rights reserved.

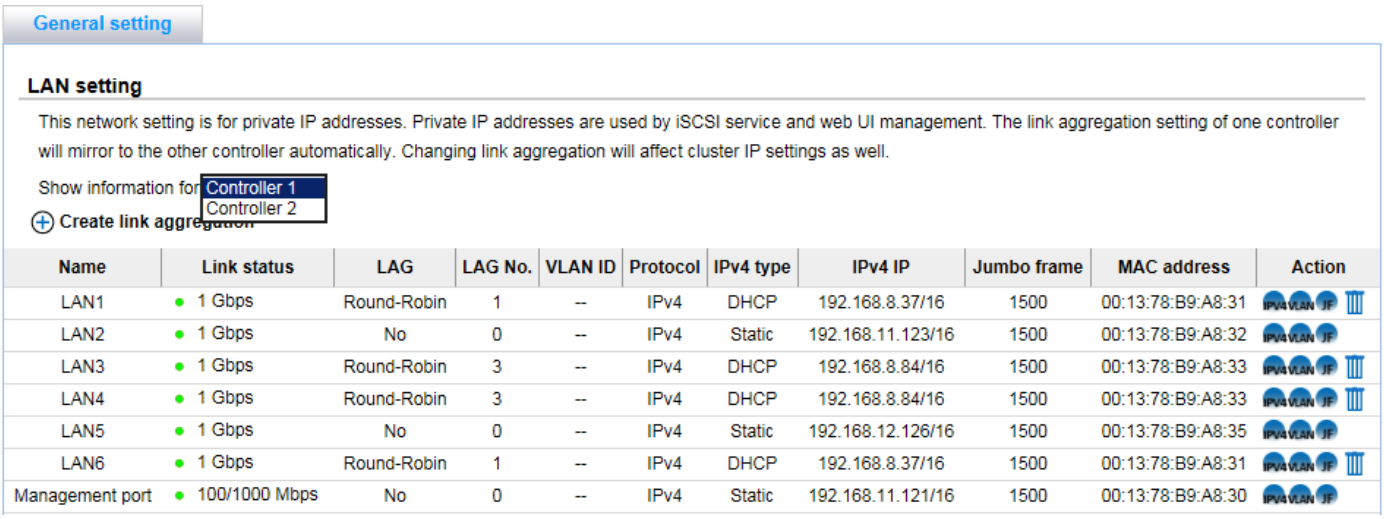

General setting
LAN setting
This network setting is for private IP addresses. Private IP addresses are used by iSCSI service and web UI management. The link aggregation setting of one controller will mirror to the other controller automatically. Changing link aggregation will affect cluster IP settings as well.
Show information for
Controller 1
Controller 2
Create link aggregation
Name
Link status
LAG
LAG No.
VLAN ID
Protocol
IPv4 type
IPv4 IP
Jumbo frame
MAC address
Action
LAN1 1 Gbps Round-Robin 1 -- IPv4 DHCP 192.168.8.37/16 1500 00:13:78:B9:A8:31
LAN2 1 Gbps No 0 -- IPv4 Static 192.168.11.123/16 1500 00:13:78:B9:A8:32
LAN3 1 Gbps Round-Robin 3 -- IPv4 DHCP 192.168.8.84/16 1500 00:13:78:B9:A8:33
LAN4 1 Gbps Round-Robin 3 -- IPv4 DHCP 192.168.8.84/16 1500 00:13:78:B9:A8:33
LAN5 1 Gbps No 0 -- IPv4 Static 192.168.12.126/16 1500 00:13:78:B9:A8:35
LAN6 1 Gbps Round-Robin 1 -- IPv4 DHCP 192.168.8.37/16 1500 00:13:78:B9:A8:31
Management port 100/1000 Mbps No 0 -- IPv4 Static 192.168.11.121/16 1500 00:13:78:B9:A8:30

Fig 3-11 LAN setting table

Select “Controller1” or “Controller2” from the drop-down list to choose which controller to look at.

Item name	Description
Name	Network port name on the controller bracket. (Fig 1-1)
Link status	This shows if the network cable is connected correctly. Link speed is displayed as well for reference.
LAG	No : There is no link aggregation. Seven Linux bonding methods are all supported and displayed here.
LAG No.	Aggregation ID.
VLAN ID	-- : no VLAN VLAN ID is displayed here.
Protocol	IPv4 or IPv6 (IPv6 is not supported).
IPv4 type	Static IP or DHCP.
IPv4 IP	IP address and subnet mask.
Jumbo frame	Jumbo frame size.
MAC address	Hardware address of the network interface.
Action	Available functions to the network interface are listed here. IPV4 This is where to set the private IP. VLAN This is where to set VLAN ID. JF This is where to enable jumbo frame. Delete link aggregation.

Click IPV4 to set private IP address. If you have DHCP server in the network environment, please select DHCP to use dynamic IP assignment. Select Static to put in a fixed IP address. BOOTP stands for Bootstrap Protocol. It’s another option for dynamic IP assignment. Please be aware that IPv6 is not currently supported yet.

©2015 Qsan Confidential. All rights reserved.

This private IP addresses are used by iSCSI target service and web UI management service. In addition to the management port, all other network ports can provide web UI management service through private IPs.

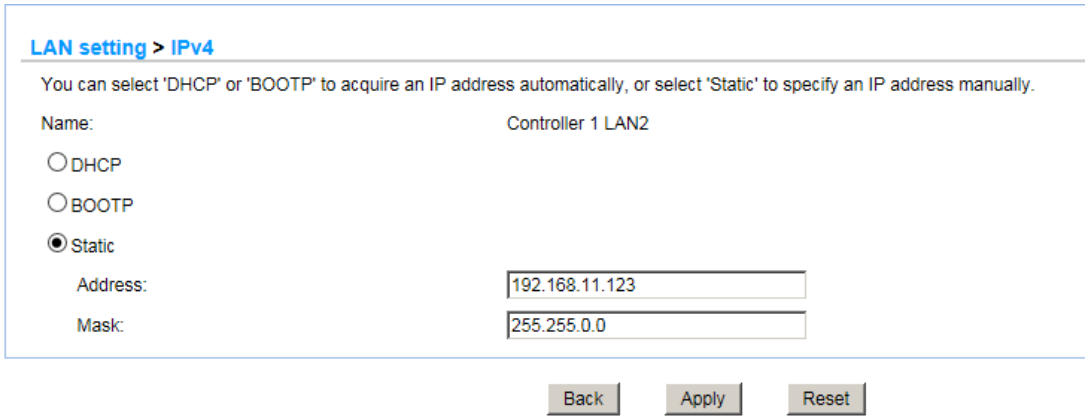


Fig 3-12 Private IP setting

Click VLAN to set VLAN ID. The VLAN ID setting will automatically mirror to the other controller. This is due the cluster IP design. In case, when failover happens, the other network interface should have the same VLAN setting in order to resume the original network connections.

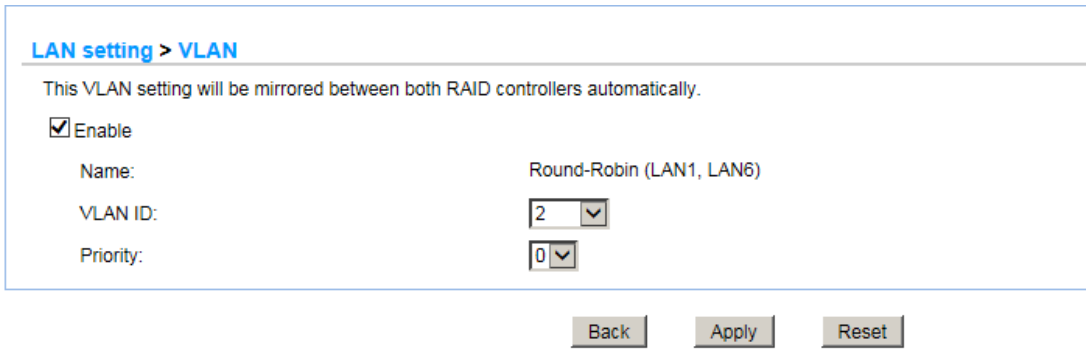


Fig 3-13 VLAN ID setting

Click JF to enable or disable jumbo frame. The jumbo frame size is 9000bytes. It will be displayed in Fig 3-14 table.

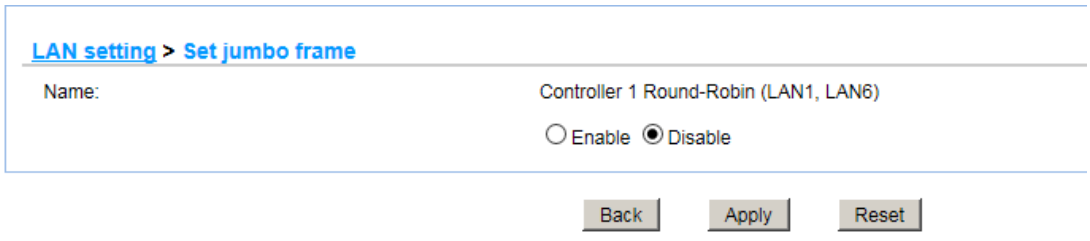


Fig 3-14 Jumbo frame setting

©2015 Qsan Confidential. All rights reserved.

Click ⊕ Create link aggregation to start with link aggregation. All seven Linux aggregation modes are supported, which includes round-robin, active backup, trunking, broadcast, LACP, transmit load balancing, and adaptive load balancing.

Like VLAN setting, aggregation will be automatically applied to both controllers due to cluster IP design. This is why in Fig 3-15 it shows information from both controllers. You can set up LAG IP address in one step. This also echoes to Fig 3-7 diagram.

Please be aware that management port is not allowed for aggregation. This is to make sure that at least this port can provide management function if all other data ports go wrong.

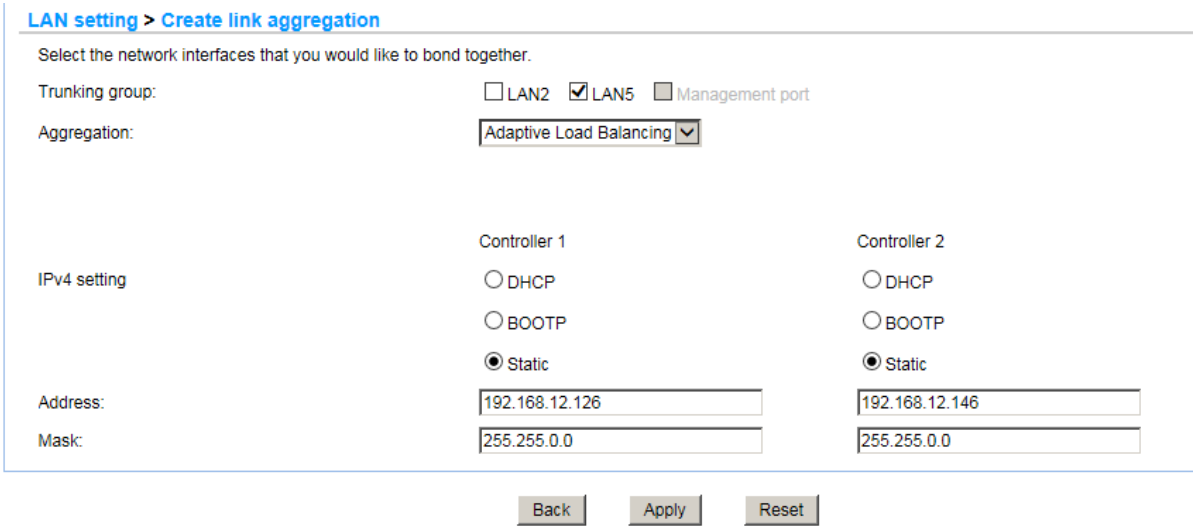


Fig 3-15 Create link aggregation

TIP:
Aggregation mode:
Round-Robin: Transmit network packets in sequential order from the first available network interface (NIC) slave through the last. This mode provides load balancing and fault tolerance.

Active Backup: Only one NIC slave in the bond is active. A different slave becomes active if, and only if, the active slave fails. The single logical bonded interface's MAC address is externally visible on only one NIC (port) to avoid distortion in the network switch. This mode provides fault tolerance.

Trunking: Transmit network packets based on [(source MAC address XOR'd with destination MAC address) modulo NIC slave count]. This selects the same NIC slave for each destination MAC address. This mode provides load balancing and fault tolerance.

©2015 Qsan Confidential. All rights reserved.

Broadcast: Transmit network packets on all slave network interfaces. This mode provides fault tolerance.

LACP: IEEE 802.3ad Dynamic link aggregation (802.3ad) Creates aggregation groups that share the same speed and duplex settings. Utilizes all slave network interfaces in the active aggregator group according to the 802.3ad specification.

Transmit Load Balancing: The bonding driver mode that does not require any special network-switch support. The outgoing network packet traffic is distributed according to the current load (computed relative to the speed) on each network interface slave. Incoming traffic is received by one currently designated slave network interface. If this receiving slave fails, another slave takes over the MAC address of the failed receiving slave.

Adaptive Load Balancing: It includes transmit load balancing plus receive load balancing for IPV4 traffic, and does not require any special network switch support. The receive load balancing is achieved by ARP negotiation. The bonding driver intercepts the ARP Replies sent by the local system on their way out and overwrites the source hardware address with the unique hardware address of one of the NIC slaves in the single logical bonded interface such that different network-peers use different MAC addresses for their network packet traffic.

(* Reference from http://en.wikipedia.org/wiki/Link_aggregation)

Default gateway

This is where to enable or disable the port as default gateway. When the page pops up, if “Enabled” is not checked, it means there is no default gateway. If “Enabled” is checked, the current default gateway will be displayed in “Interface” and “Address” as in Fig 3-16 below.

Only one default gateway can be specified. To set a default gateway, simply check “Enabled”, select the network interface, and put in the IP address. Click “Apply” to commit the change and a pop-up message will acknowledge that the setting is ok.

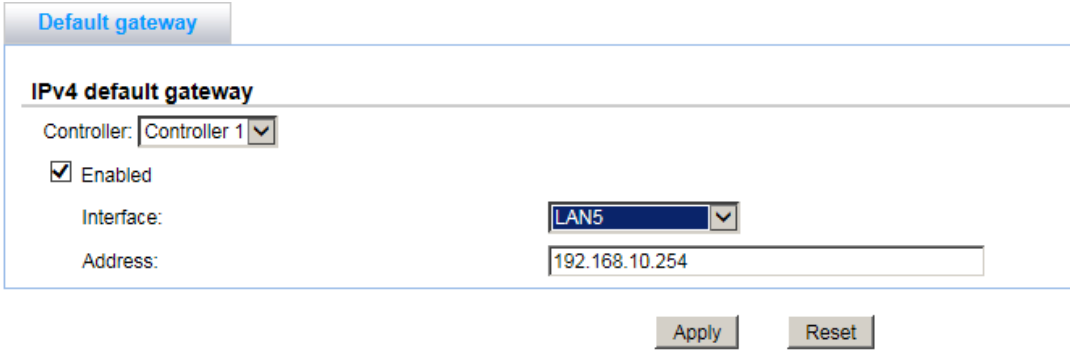


Fig 3-16 Default gateway

©2015 Qsan Confidential. All rights reserved.

DNS

DNS stands for Domain Name System. It's a name resolution service that translates domain name into corresponding IP address. The meaning of each item in Fig 3-17 is explained below.

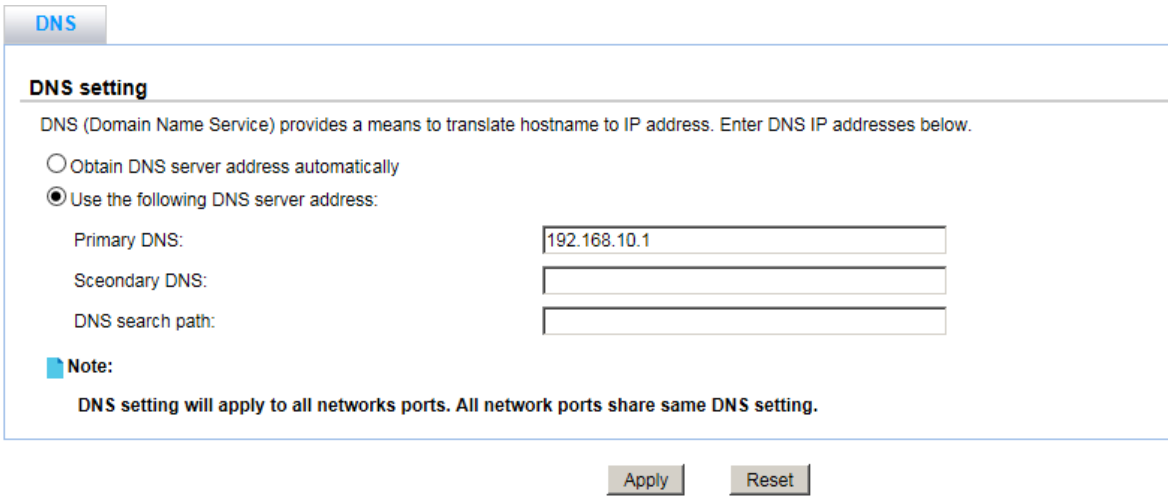

DNS
DNS setting
DNS (Domain Name Service) provides a means to translate hostname to IP address. Enter DNS IP addresses below.
Obtain DNS server address automatically
Use the following DNS server address:
Primary DNS:
192.168.10.1
Sceondary DNS:
DNS search path:
Note:
DNS setting will apply to all networks ports. All network ports share same DNS setting.
Apply
Reset

Fig 3-17 DNS setting

Item name	Description
Obtain DSN server address automatically	Use DHCP server to obtain DNS related information.
Primary DNS	The IP address of DNS server can be entered or changed here. The DNS settings will be applied to all network ports, which mean you ONLY need to select one of the network ports and start DNS setting.
Secondary DNS	This is optional.
DNS search path	It is a list of domains to try when the system tries to translate a machine name into an IP address. It provides more flexibility than the simple domain statement.

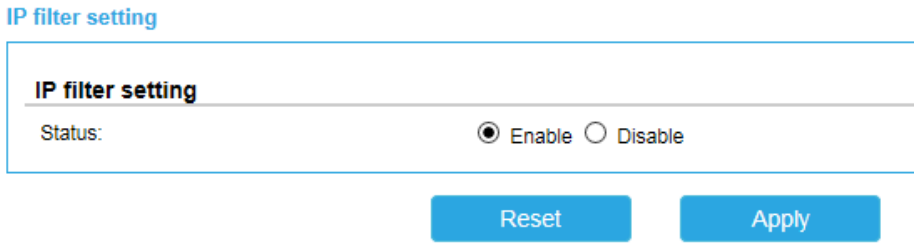
A storage pool can be made of up to 512 RAID sets, which can use different RAID levels. File systems for file sharing and volumes for iSCSI LUNs are created from the storage pool. Please check the following graph.

IP filtering

IP filtering provides basic firewall function to screen the incoming connection IP address. It's also a way of access control at IP address level.

To enable IP filtering function, go to "Security -> IP filter -> IP filter setting". Select "Enable" and click "Apply".

©2015 Qsan Confidential. All rights reserved.



To create filtering rules, go to “Security -> IP filter -> IP filter rules”. Click ⊕ Create to create a new rule. The meaning of each item in Fig 3-18 is explained below.

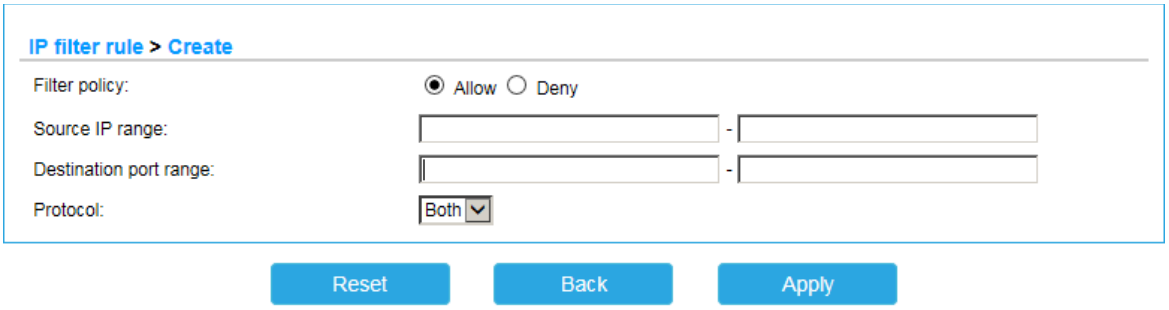


Fig 3-18 Add a IP filtering rule

Item name	Description
Filter policy	Allow : IP address falling in the range criteria is allowed for connection. Deny : IP address falling in the range criteria is denied for connection.
Source IP range	Enter the starting IP address and ending IP address
Destination port range	Enter the port range 1 to 65535
Protocol	Select the network protocol for screening.

Simple management functions are provided from the table, you can use ✎ to edit the rule or use 🗑 to delete the rule.

Power management

UPS

TrioNAS LX HA supports and communicates with Smart-UPS series through network function by APC (American Power Conversion Corp, http://www.apc.com/) and Megatec-UPS (Mega System Technologies Inc, http://www.megatec.com.tw/).

TIP:
Connection with other vendors of UPS can work well, but they have no such communication features with the system.

©2015 Qsan Confidential. All rights reserved.

TrioNAS LX HA supports network UPS via SNMP protocol. Please connect the network cable to UPS and then set up the shutdown values. When the power goes out, UPS will function according to the setting.

Go to “System setting -> Power management -> UPS”. The meaning of each item in Fig 3-19 is explained below.

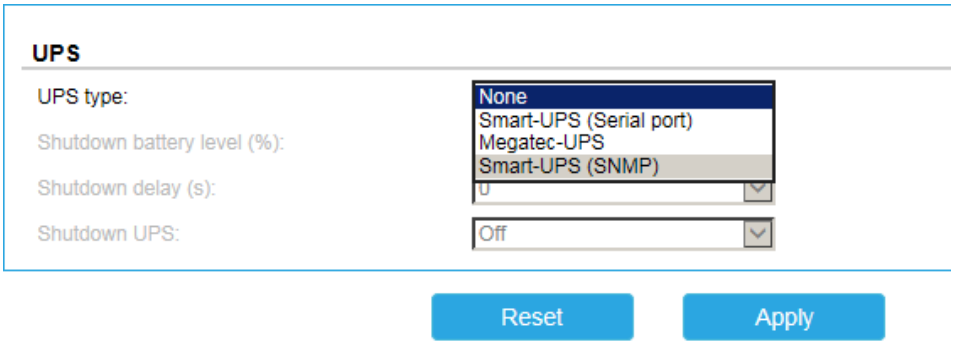


Fig 3-19 UPS setting

Item name	Description
UPS type	Select UPS Type: • None: No UPS or other vendors. • Smart-UPS (Serial port): APC Smart-UPS with RS-232. • Megatec-UPS: Mega System Technologies Inc UPS. • Smart-UPS (SNMP): APC Smart-UPS with network function.
IP address	(*This option is only visible when SNMP UPS is selected.*) The IP address of the network UPS.
Community	(*This option is only visible when SNMP UPS is selected.*) The SNMP community of the network UPS.
Shutdown battery level (%)	When the battery level goes down and lower than the configured threshold, the system will auto shutdown. This function will be disabled if the configured threshold is set to “0”.
Shutdown delay (s)	When there is the power outage happening, if the power cannot be recovered within the configured time, such as 30 seconds, the system will auto shutdown at the moment. This function will be disabled if the configured seconds is set to “0”.
Shutdown UPS	The status of shutdown UPS: • ON: The system will send the command to shutdown the connected UPS if one of the above functions is triggered when the power outage is happening. • OFF: Disable this function.

The system will shutdown either Shutdown battery level (%) or Shutdown delay (s) reaches the condition. User should set these values carefully.

©2015 Qsan Confidential. All rights reserved.

4 Manage shares, LUNs, and data services

This chapter describes how to create shares, access, and manage shares and LUNs on TrioNAS LX HA. All data services will be explained here. Below are the sections included in this chapter.

- Share management
- LUN management
- Data services
- CIFS and Windows
- NFS and Linux
- NFS and vSphere
- iSCSI target for Windows iSCSI initiator

Share management

In TrioNAS LX HA, only volumes created from a storage pool can be used as shares. Folders inside a volume are not allowed to be used as shares. However, folders inside a share support Windows ACL function for added privilege settings.

Create shares

Because shares come from volumes (or volumes turn into shares), make sure you have created volumes first.

Go to “Privilege setting -> Shared folders”. Click ⊕ Create share folder and Fig 4-1 will pop up.

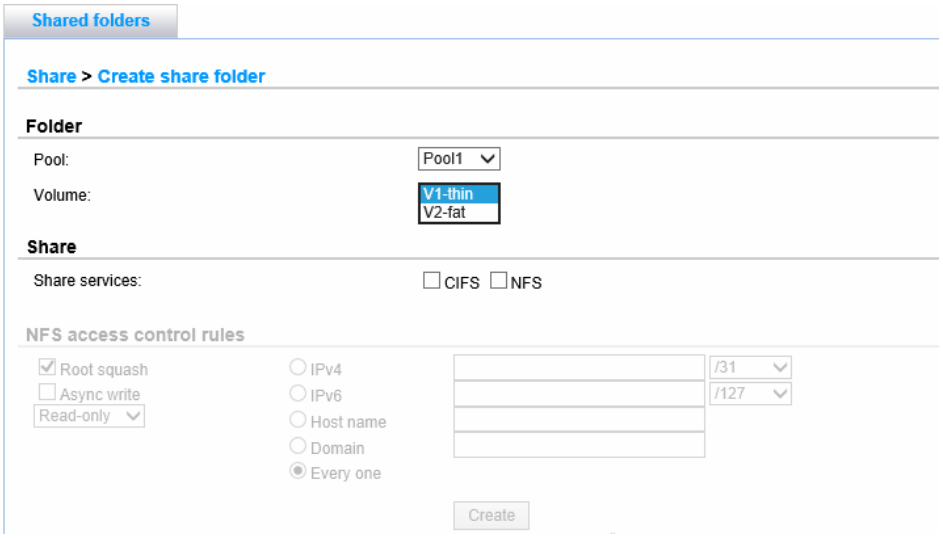


Fig 4-1 Create a share

©2015 Qsan Confidential. All rights reserved.

Item name	Description
Pool	Select a storage pool that contains the required volume.
Volume	Select the required volume.
Share services	Enable the file-sharing protocols associated with this share. Currently, only CIFS (SMB2) and NFS (v3/v4) protocols are provided. Access control settings associated with each file-sharing protocol will be enabled as each checkbox is checked. * AFP, FTP, and webDAV will be provided in the near future along with new firmware release.

Check “NFS” to enable NFS access control rules as in Fig 4-2 below.

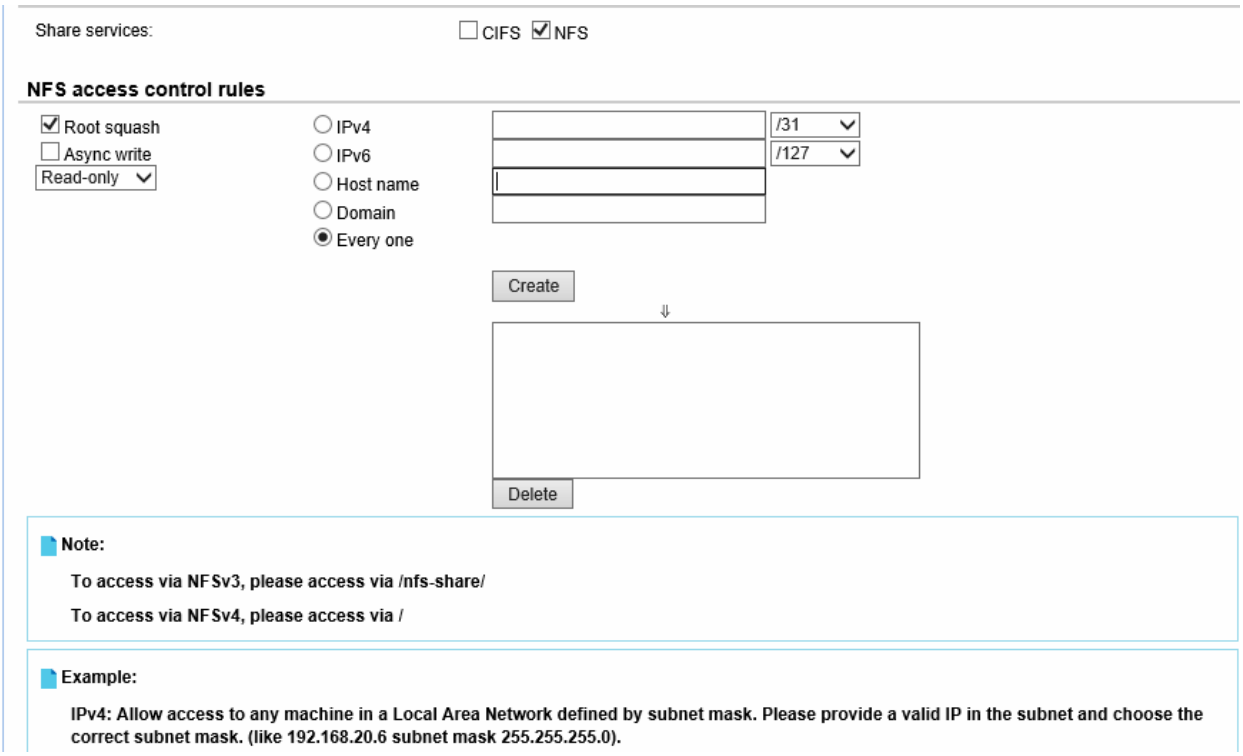


Fig 4-2 NFS access control

These settings will go into the configuration file - /etc/exports on TrioNAS LX HA. Use these checkboxes and radios to come out the NFS rules you want. Create one rule each time by clicking “Create” button. Please be aware that you are responsible for the rules you just created. TrioNAS LX HA will not validate the correctness of the rules. There are examples and explanations on the web page to help you create the rules. Or you may refer to the explanations below.

©2015 Qsan Confidential. All rights reserved.

NFS access control rules:

- Root squash: Uncheck this to use no_root_squash setting.
- Async write: Check this to use asynchronous write function. The performance will be better than synchronous write.
- Read only and Read/Write: Set the read/write permission.
- IPv4: Allow a group of computers that are in a certain IP range to access the share.
  - The number (1~31) in the drop down list represent the network mask value. It stands for the total number of binary "1" in the network mask. For example, a network mask of 255.255.0.0 in binary form will become 11111111.11111111.0.0. So number 16 will stand for a network mask of 255.255.0.0.
  - Simply provide a valid IP address within your destination range.
  - IPv6: Same meaning as IPv4 above. Instead it accepts IPv6 address only.
- Hostname: Use this option to specify a specific computer for access. There are 3 forms allowed. Putting in an invalid form or value will cause IO error or inability to access the share. Please be careful.
  - A valid IP address
  - A DNS recognized name : the system name or machine name
  - FQDN name : Fully Qualified Domain Name
- Domain: Use this option if you want to allow all the computers in a certain network domain to have access to the share.
- Everyone: Allow access to computers from all kinds of IP addresses.

CAUTION:
Please be aware that users will have only read permission to their own home directory shares using NFS service. This is due to security purpose and the nature of NFS protocol. This is to avoid that a user uses a matching UID to access someone else home directory.

CAUTION:
Be careful of the rules you put in. Users need to have basic knowledge about how to set up NFS exports parameters. The system will not do validation check for you. It's up to user's discretion to provide the correct rules.

©2015 Qsan Confidential. All rights reserved.

Check “CIFS” to enable CIFS access control rules as in Fig 4-3 below.

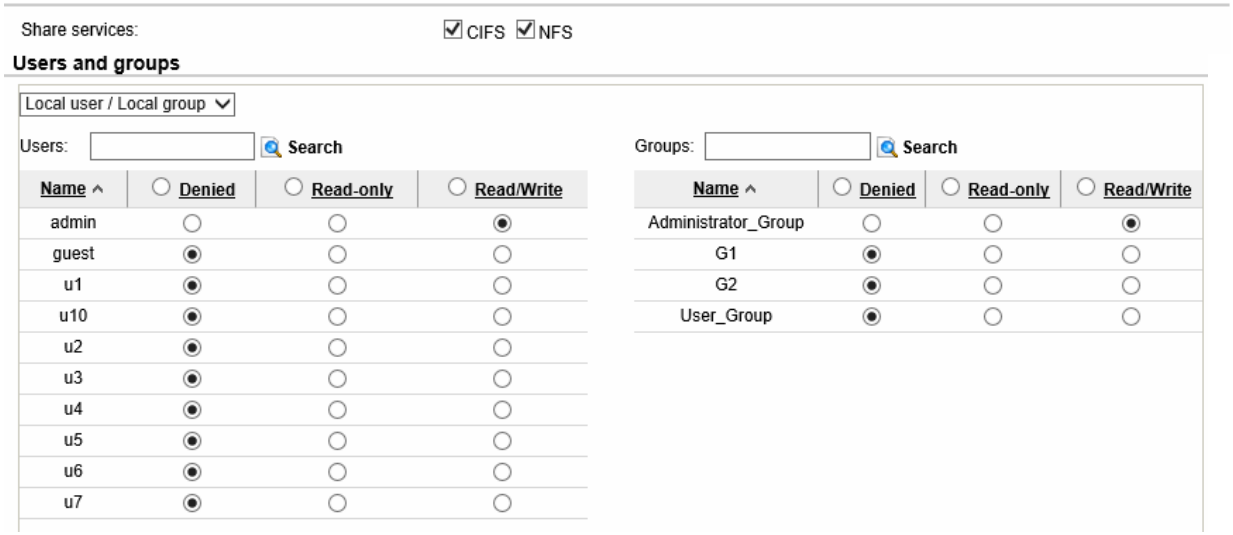


Fig 4-3 CIFS access control

If the NAS system already joined a domain, use Local user / Local group drop-down list to select the domain you want to use. If there are too many accounts and you can’t find the one you want, use the Search function to locate it.

Here you can set read/write access rights of each account and group for this share. Click “Apply” to commit the changes.

Manage shares

Go to “Privilege setting -> Shared folders” to manage your shares. You will see a table like Fig 4-4 below. The meaning of each item is explained below.

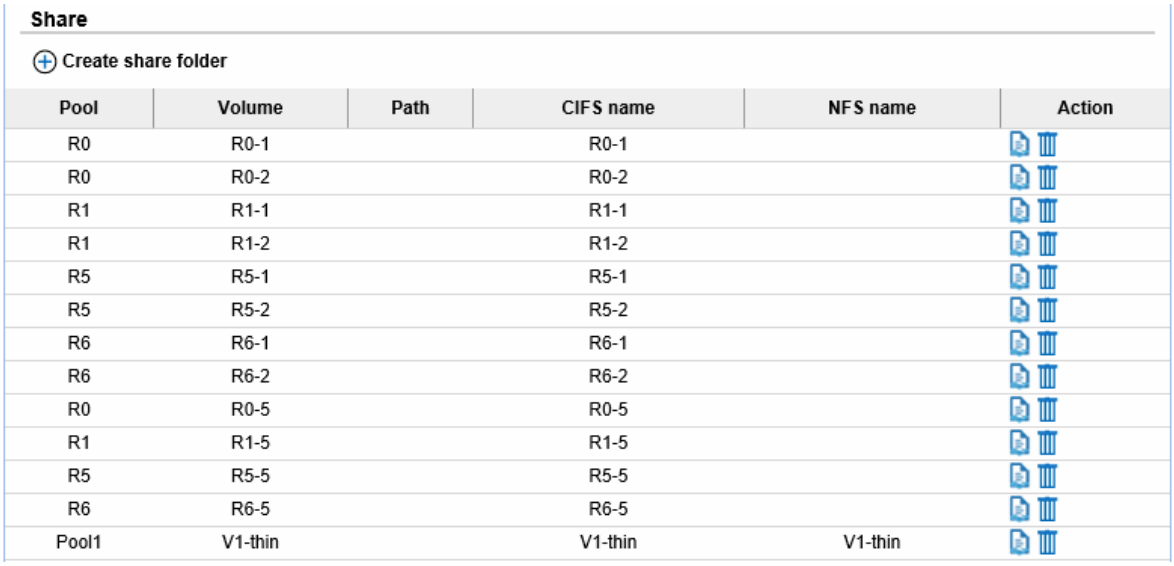


Fig 4-4 Share table

©2015 Qsan Confidential. All rights reserved.

Item name	Description
Pool	Which pool this share belongs to.
Volume	Which volume this share is.
Path	The physical path in NAS system.
CIFS name	Share name for CIFS service.
NFS name	Share name for NFS service.
Action	Available functions to this item are listed here. Edit the share settings. Delete the share.

File Explorer

Explorer gives you a bird-eye view of the whole storage array. Please check Fig 4-5 below. On the left hand side, it a tree structure to show the relationships between pools and volumes. Below is icon description.

- The root of the array storage
- Storage pool
- Folder (Folder can not be turned into a share)
- Volume (not been shared out yet)
- Share (It's a Volume as well)
- Search folder or file

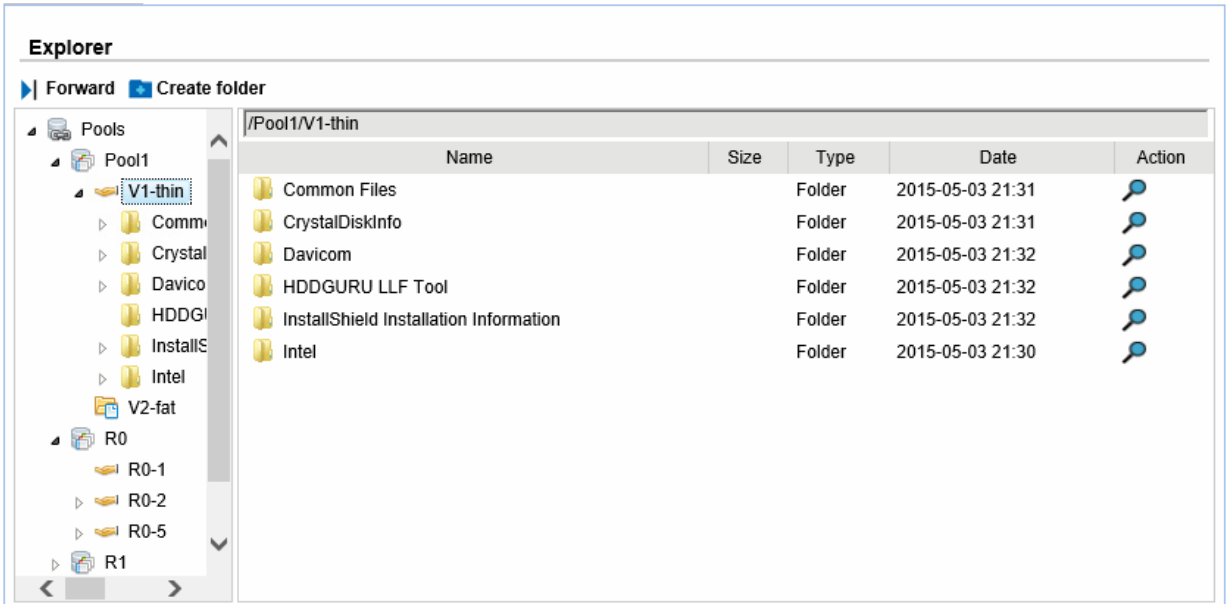


Fig 4-5 File Explorer

Click Create folder to create a folder if necessary. You can search a particular file or folder in a complicated and deep directory structure by using search function. It can make your life easier.

©2015 Qsan Confidential. All rights reserved.

LUN management

In Chapter 2, we already introduce how to create LUNs. Before the LUN can be used for actual storage, you need to assign LUN to a designated iSCSI target, which is represented by a number. Go to "Storage management -> iSCSI -> Mapping". Click Attach. Fig 4-6 below shows how to assign a LUN number to each LUN. The meaning of each item is described below.

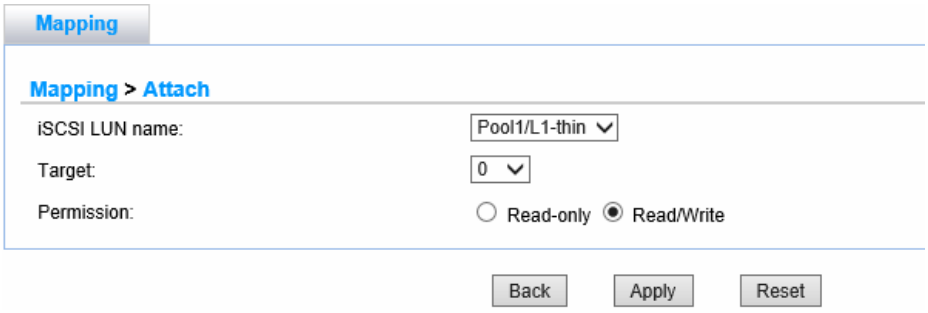


Fig 4-6 Map a LUN to an iSCSI target

Item name	Description
iSCSI LUN name	Select a LUN from the drop-down list. All available LUNs will be displayed in the drop-down list.
Target	TrioNAS LX HA can emulate up to 64 iSCSI targets. According to this target number, an emulated iSCSI target entity name will be created. For example, iqn.2004-08.com.qsantechnology:u400ha-424-000901a00:dev#.ctr1 is the iSCSI target name seen in iSCSI initiator end. Target 0 will be dev0. Target 1 will be dev1. And so on. Target 63 is dev63.
Permission	Access rights to this LUN

To show the concept of iSCSI target number, Fig 4-7 below shows what it looks like in iSCSI initiator.

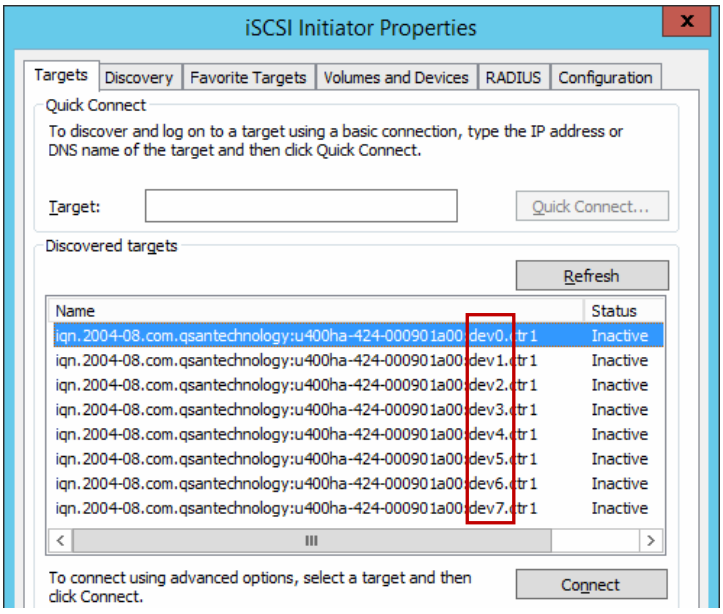


Fig 4-7 iSCSI targets shown in iSCSI initiator

©2015 Qsan Confidential. All rights reserved.

Let's assign L1-thin to iSCSI target 0. Click "Apply" and the following Fig 4-8 will show up. The meaning of each item is described below.

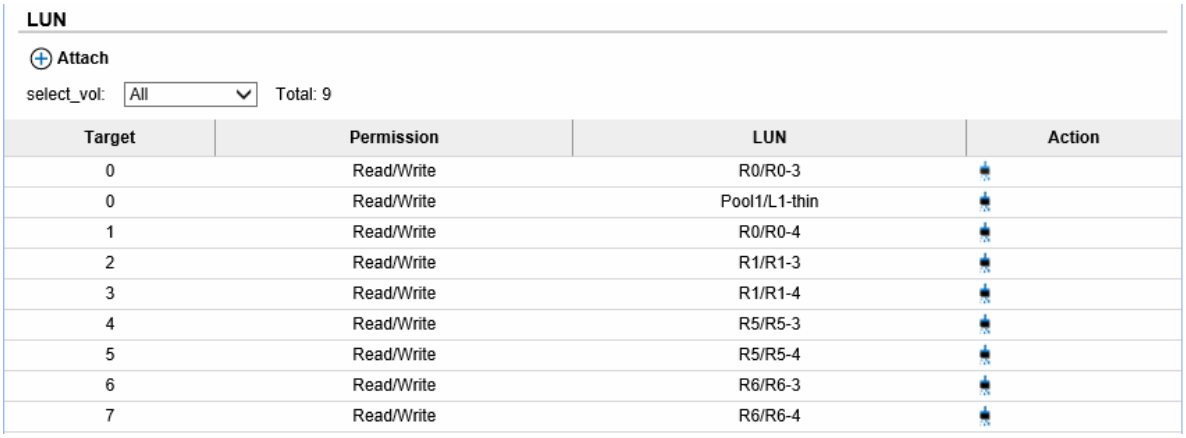


Fig 4-8 LUN mapping table

Item name	Description
Target	iSCSI target number or iSCSI node number.
Permission	Access rights of the LUN
LUN	A/B format shows where this LUN comes from. A : pool name B : LUN name
Action	Available functions for this item. Detach LUN to remove this LUN from the iSCSI target.

After this step, the iSCSI initiator should be able to see the iSCSI targets that connect to it. And once the connection is established, the LUNs assigned to the iSCSI target will show up in the host server that runs the iSCSI initiator.

Data services

This section will introduce the data services provided in TrioNAS LX HA. They are :

- File-sharing protocol : CIFS, NFS
- SAN protocol : iSCSI

CIFS service

CIFS stands for Common Internet File System. CIFS is a network protocol that offers file sharing service for Windows computers. SMB version 2 is supported in TrioNAS LX HA. SMB version 3 will be supported in the near future with new firmware release.

To use CIFS service, please make sure the service is enabled and running normally. You can check the service status in Dashboard, which is the first page when you login into the web UI management page. Fig 4-9 below shows where to check data service status.

©2015 Qsan Confidential. All rights reserved.

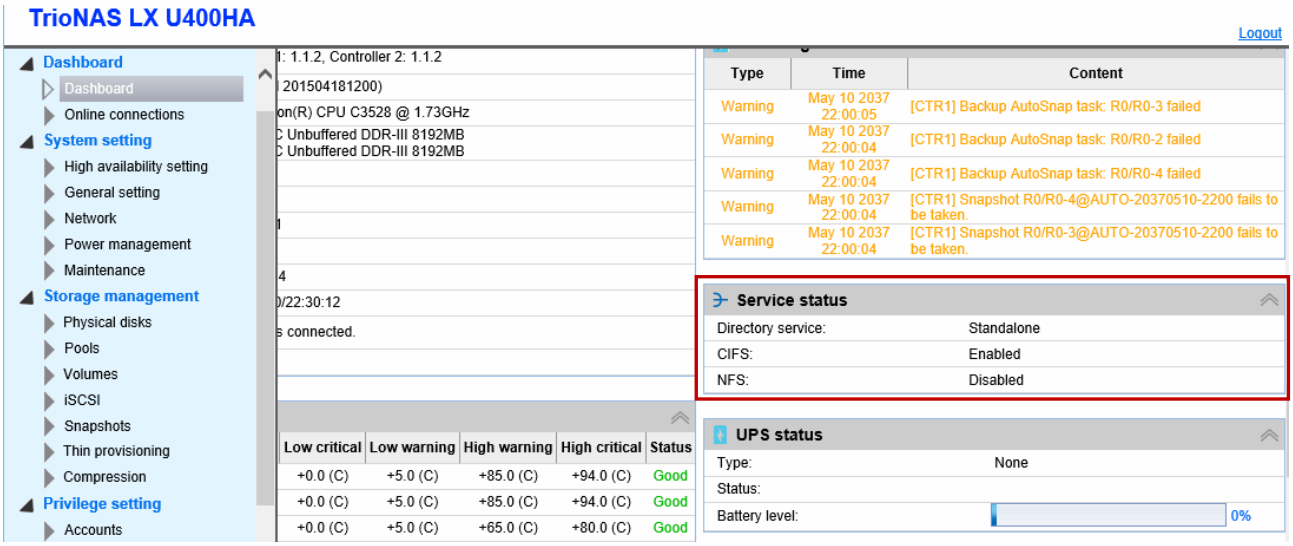


Fig 4-9 Data service status in Dashboard page

Go to “Privilege setting -> File services -> Windows”. After enabling CIFS service, the following TCP and UDP ports will be enabled as well.

- TCP 139 (smbd)
- TCP 445 (smbd)
- UDP 137 (nmbd)
- UDP 138 (nmbd)

The meaning of each item is described below.

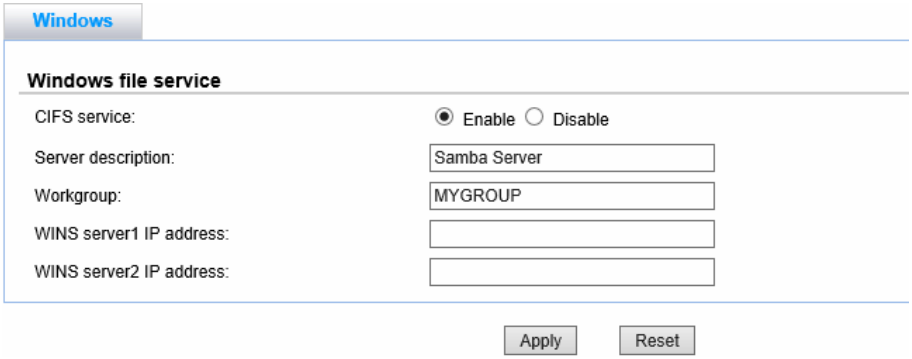


Fig 4-10 CIFS service

Item name	Description
CIFS service	Enable or Disable the service.
Server description	Default is “Welcome to CIFS server”. Maximum length is 256 characters.
Workgroup	Default is “Workgroup”. Maximum length is 16 characters.
WINS server1 IP	WINS Server IP Address. Default is empty. If it’s empty, the name resolution priority is DNS only. Otherwise, the name resolution priority is WINS server first, and then DNS.
WINS server2 IP	The same as above.

©2015 Qsan Confidential. All rights reserved.

Click “Apply” to commit the changes.

NFS service

NFS stands for Network File System. NFS is a network protocol for sharing files and directories over Ethernet among Linux computers and Unix computers. NFS version 3 and version 4 are supported in TrioNAS LX HA.

To use CIFS service, please make sure the service is enabled and running normally. You can check NFS service status in Dashboard as of Fig 4-9.

Go to “Privilege setting -> File services -> NFS”. After enabling NFS service, the following TCP and UDP ports will be enabled as well.

- TCP 111 (rpcbind)
- TCP 2049 (nfsd)
- UDP 111 (rpcbind)
- Additionally, mountd and rpcbind will each bind to a randomly available UDP port.

The meaning of each item is described below.

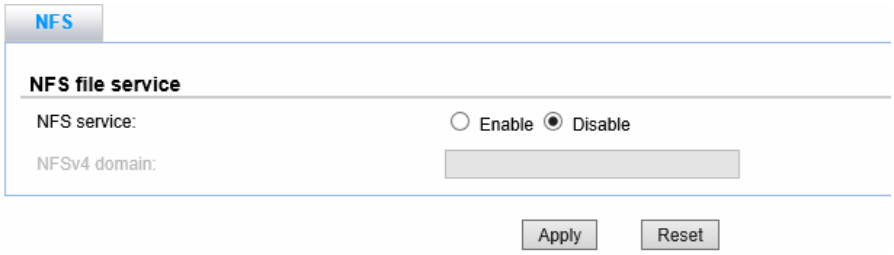


Fig 4-11 NFS service

Item name	Description
NFS service	Enable or Disable the service.
NFSv4 domain	If you are using NFSv4 protocol, please make sure NFSv4 domain is provided in order to have ID mapping function working correctly.

Click “Apply” to commit the changes.

iSCSI service

iSCSI target service is supported in TrioNAS LX HA. iSCSI protocol encapsulates SCSI commands directly into TCP/IP network packets, so it provides block-based storage space. Currently, iSCSI initiator service is not provided in TrioNAS LX HA.

©2015 Qsan Confidential. All rights reserved.

Go to “Storage management -> iSCSI -> General setting” to adjust iSCSI target setting. The meaning of each item in Fig 4-12 is explained below.

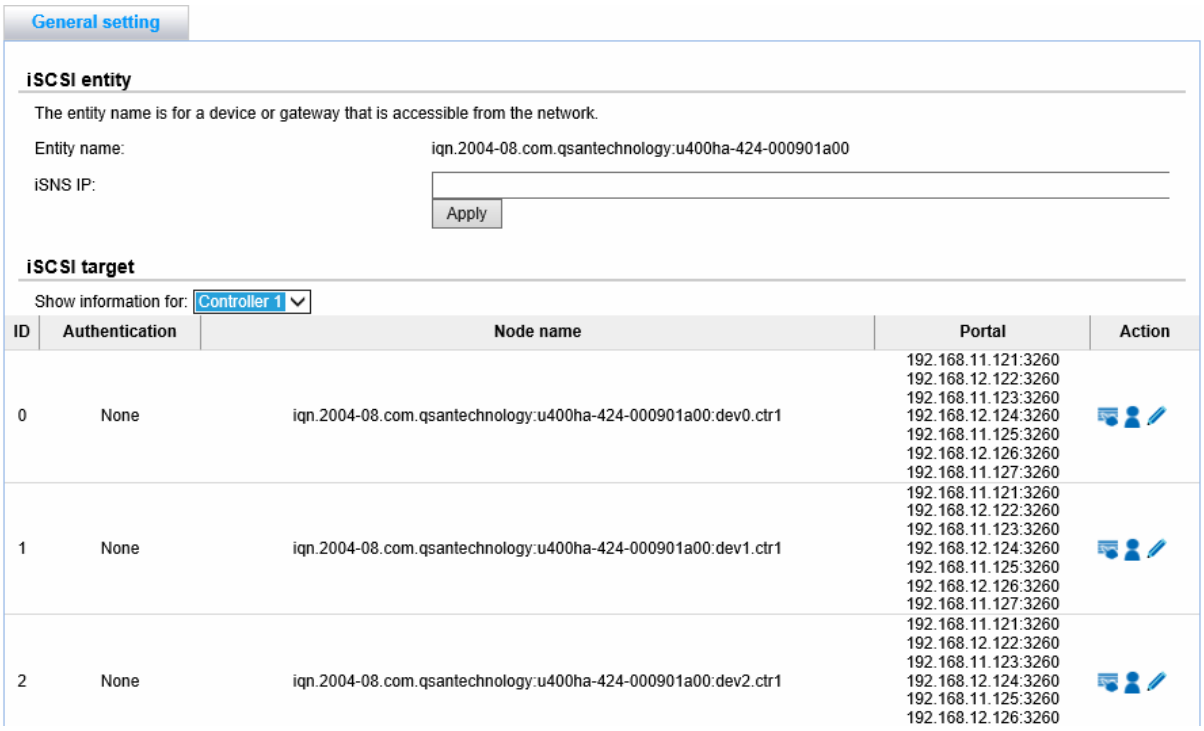


Fig 4-12 iSCSI target service

Item name	Description
Entity name	This is the base part of iSCSI target entity name. It will combine with different iSCSI target IDs to become multiple emulated iSCSI targets (we call then iSCSI target nodes) as if there are multiple iSCSI target appliances.
iSNS IP	iSNS (Internet Storage Name Service) server provides automated discovery, management and configuration of iSCSI devices. If there is an iSNS server in the network, enter its IP address here to register TrioNAS LX HA in its database.
Show information for	Select controller 1 or controller 2.
ID	iSCSI target ID or node number. Each controller supports 64 IDs, which means 64 virtualized iSCSI targets for each controller. The full entity name has the following naming format. iqn.2004-08.com.qsantechnology:u400ha-424-000901a00:dev#.ctr1 dev# : # is ID from 0 to 63. ctr1 stands for controller 1. ctr2 stands for controller 2.
Authentication	Enable CHAP account or not. CHAP : CHAP account is enabled.

©2015 Qsan Confidential. All rights reserved.

	None : CHAP account is disabled.
Node name	Emulated iSCSI target entity name.
Portal	Assign network interfaces to the iSCSI target.
Action	Available functions are listed here. "Set properties". Click this icon to enable/disable CHAP authentication for this iSCSI target node ONLY. "Set user". Click this icon to select the users (domain users) that are allowed to access this iSCSI target node. "Change network portal". Click this icon to adjust the network interface assignment.

Click "Apply" to commit the changes.

LUN mapping management

After creating a LUN, you need to assign the LUN to an iSCSI target node before the LUN can be accessed by iSCSI initiator. This process is called – Attach.
The rules are below :

- A LUN can be attached to many iSCSI target nodes.
- An iSCSI target node can have many LUNs attached.
- It's a many to many relation to allow maximum flexibility.

On the initiator end, the host computer can connect to different iSCSI target nodes to access different sets of LUNs. CHAP authentication implemented on each iSCSI target node can add extra access control in case the forbidden hosts are trying to establish connection (because they can still see those iSCSI target nodes they are not allowed to connect).

Go to "Storage management -> iSCSI -> Mapping" and click ⊕ Attach and Fig 4-13 will pop up. The meaning of each item in Fig 4-13 is explained below.

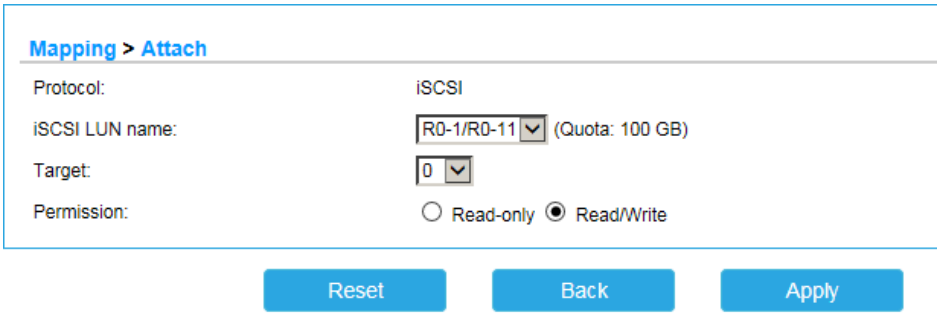


Fig 4-13 Attach a LUN

Item name	Description
iSCSI LUN name	A drop-down list shows all available LUNs in the syntax of A/B. A is storage pool name. B is LUN name.

©2015 Qsan Confidential. All rights reserved.

Target	iSCSI target node number. It's 0 ~ 63. Both controllers will have the same setting. For example : Select 7. It means the LUN is attached to iSCSI target node 7 of both controllers.
Permission	Access rights are Read-only and Read/Write.

Click "Apply" to commit the settings. Fig 4-14 below shows the LUN mapping table. The meaning of each item in Fig 4-14 is explained below.

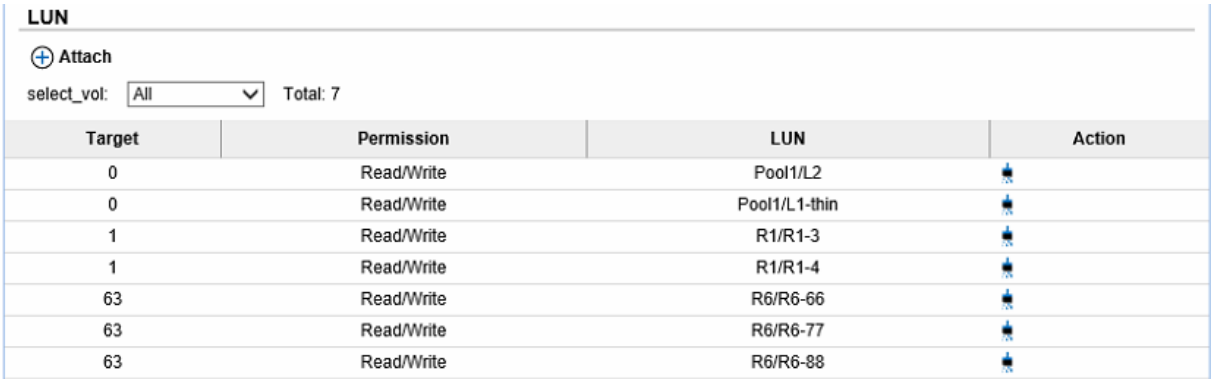


Fig 4-14 LUN mapping table

Item name	Description
Target	iSCSI target node number (0~63).
Permission	Access rights.
LUN	LUN name and storage pool name.
Action	Available functions are listed here. Detach LUN to remove the LUN from the iSCSI target node.

CIFS and Windows

There are several ways to access a network share in Microsoft Windows operating systems. It all follows Windows UNC (Universal Naming Convention) format.

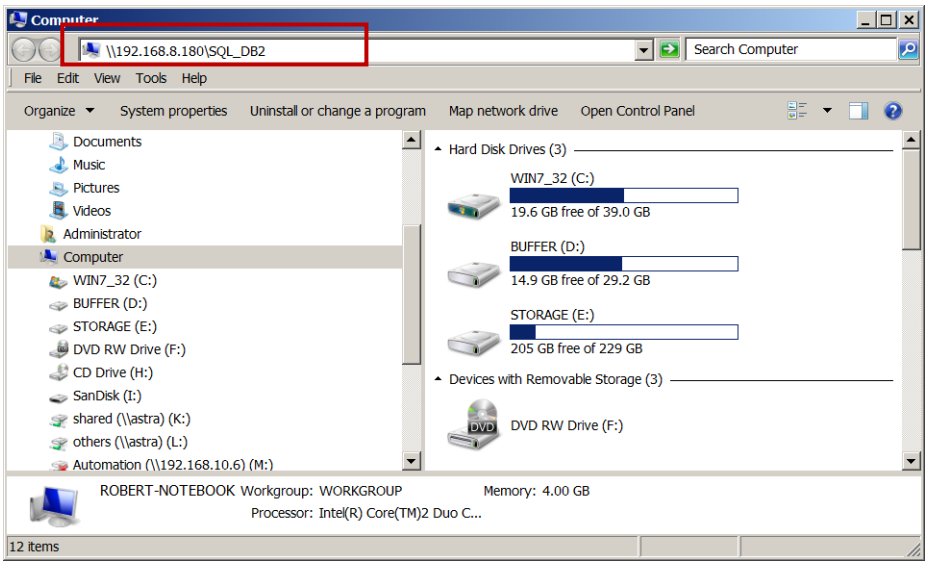
Syntax:
\\<NAS system name>\<share name>
\\<Cluster IP address>\<share name>

<NAS system name> can be found from "System setting -> General setting -> System".
<Cluster IP address> is the cluster IP address that you created from "System setting -> High availability setting -> Cluster IP setting".

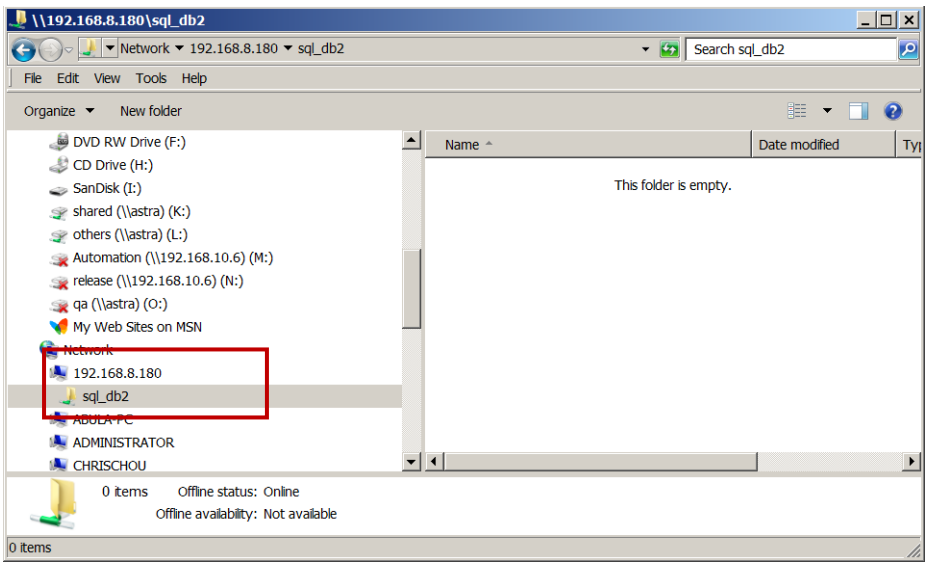
©2015 Qsan Confidential. All rights reserved.

Method 1: The address input in Explorer

Open a Windows Explorer from **Start** button or by pressing **Start key + E**. In the address input, put in the share path and press Enter. Please refer to the screenshot below.



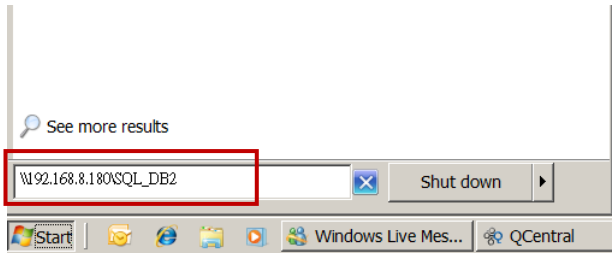
Windows will pop up a dialog requesting for account and password. Please put in your account and password. When the authentication is clear, the share is ready for you to use as follows:



Method 2: The command line input from start button

Click **Start** button to bring up the start menu. In the command line input, put in the share path and press **Enter**. The rest is the same as described in Option 1.

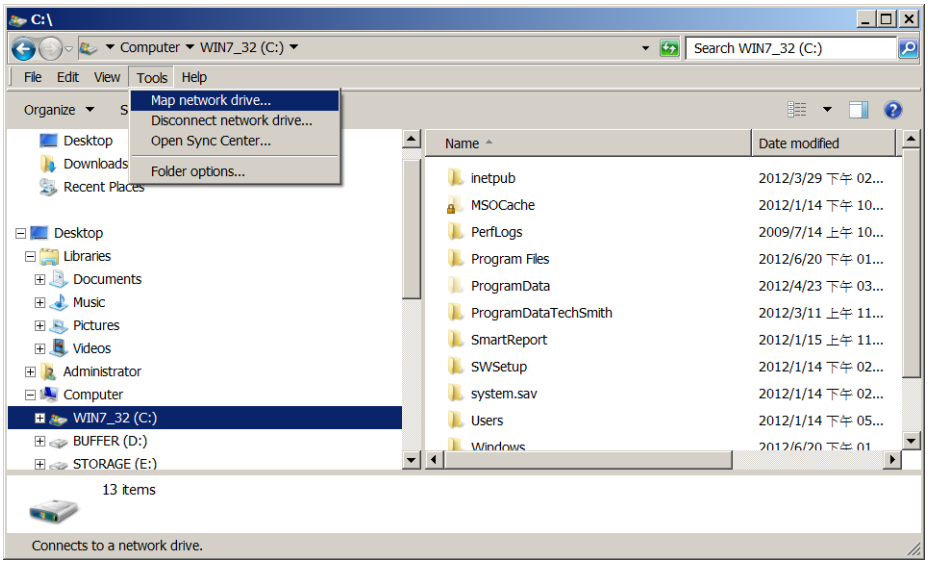
©2015 Qsan Confidential. All rights reserved.



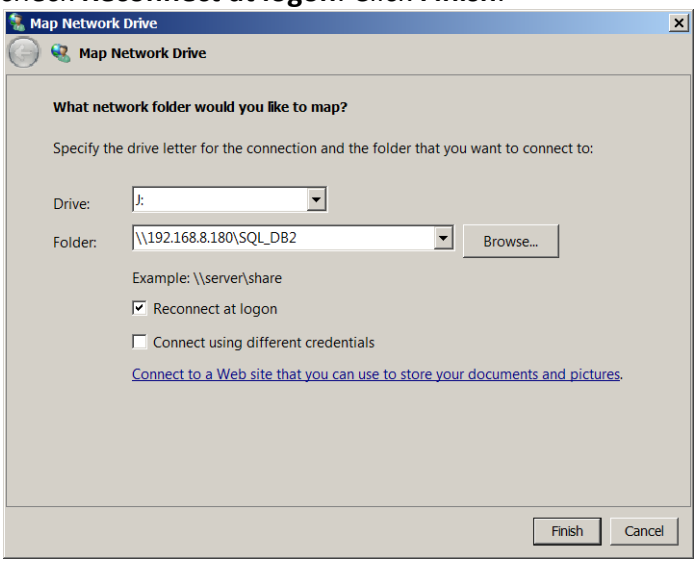
Method 3: Map a network drive in Explorer

Please follow the steps below to map a network share from Qsan unified storage to a drive letter. The network share will be automatically mapped the next time you boot your Windows.

Open a Windows Explorer from **Start** button or by pressing **Start key + E**. Go to **Tools** and select **Map network drive**.

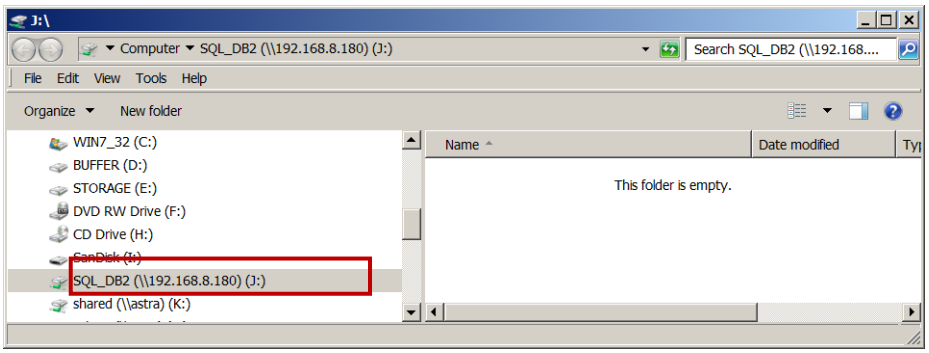


Select the drive letter you like. Put in the share path in **Folder**. Make sure you check **Reconnect at logon**. Click **Finish**.


Map Network Drive
Map Network Drive
What network folder would you like to map?
Specify the drive letter for the connection and the folder that you want to connect to:
Drive: J:
Folder: \\192.168.8.180\SQL_DB2
Browse...
Example: \\server\share
Reconnect at logon
Connect using different credentials
Connect to a Web site that you can use to store your documents and pictures.
Finish
Cancel

©2015 Qsan Confidential. All rights reserved.

You may find a new drive with the letter you just selected in Explorer. You may start using the new drive then.



NFS and Linux

TrioNAS LX HA supports NFS version 3 and version 4. If version 4 connections cannot be established, the system will automatically try to establish the connection using version 3 protocol. Before using the NFS shares, please make sure the NFS settings of the shares are properly configured.

Redhat Linux 5

When mounting a file system in Redhat Linux 5, Redhat Linux 5 uses NFS version 3 by default. Use the following syntax to mount an NFS share. Please make sure you add the keyword – **nfs-share** before the share name. It represents the absolute path that the end user doesn't need to know.

mount <IP address of NAS>:/nfs-share/<share name> <mount point>

For example:
mount 192.168.8.180:/**nfs-share**/SQL_DB2 /mnt/nas

Redhat Linux 6

The default attempt will try to use NFS version 4 protocol to set up connection in Redhat Linux 6. Use the following syntax to mount an NFS share.

mount <IP address of NAS>:/<share name> <mount point>

For example:
mount 192.168.8.180:/SQL_DB2 /mnt/nas

Open Solaris 10/11

Open Solaris 10/11 will use NFS version 4 as default. Use the following syntax to mount an NFS share.

©2015 Qsan Confidential. All rights reserved.

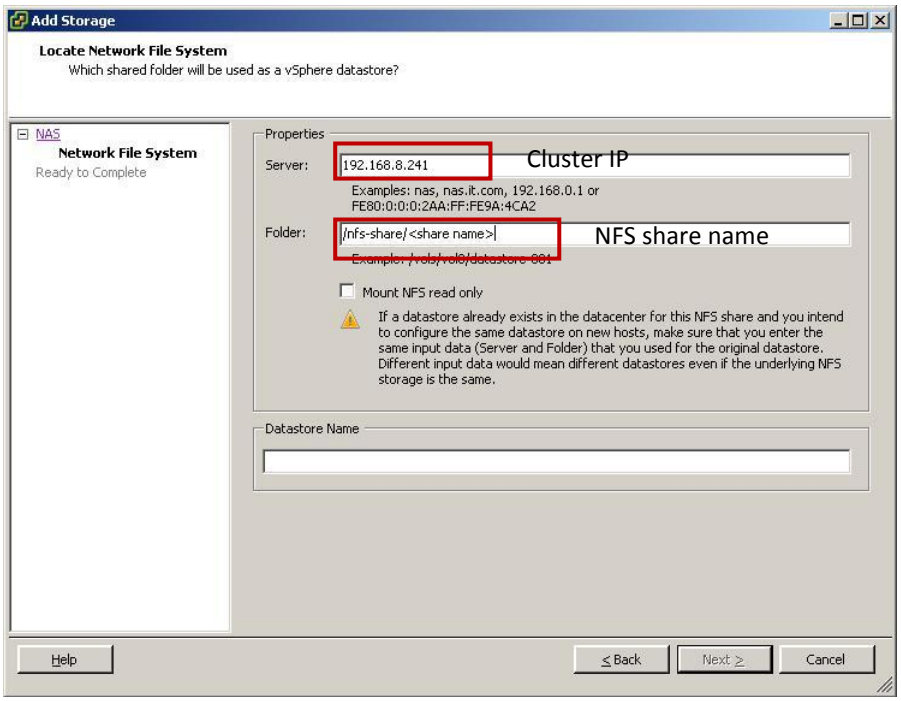
mount -F nfs -o rw <IP address of NAS>:/<share name> <mount point>

For example:
mount -F nfs -o rw 192.168.8.180:/SQL_DB2 /mnt/nas

NFS and vShpere5

If you want to use TrioNAS LX HA as vSphere 5 storage through NFS connection, please make sure you export the NFS share with read/write access rights. In the vSphere 5 UI setting for NFS share, please use the following syntax as shown in the screenshot below.

/nfs-share/<share name>


Add Storage
Locate Network File System
Which shared folder will be used as a vSphere datastore?
NAS
Network File System
Ready to Complete
Properties
Server:
192.168.8.241
Cluster IP
Examples: nas, nas.it.com, 192.168.0.1 or FE80:0:0:0:2AA:FF:FE9A:4CA2
Folder:
/nfs-share/<share name>
NFS share name
Mount NFS read only
If a datastore already exists in the datacenter for this NFS share and you intend to configure the same datastore on new hosts, make sure that you enter the same input data (Server and Folder) that you used for the original datastore. Different input data would mean different datastores even if the underlying NFS storage is the same.
Datastore Name
Help
< Back
Next >
Cancel

iSCSI and Windows iSCSI initiator

This example is based on Microsoft Windows Server 2012. Before we can proceed, please consult earlier sections regarding LUN management and LUN mapping to configure your LUNs properly.

In Windows operating systems, iSCSI initiator utility is provided as a freeware. On Windows server platform, from Windows Server 2008 going forward, Windows iSCSI initiator is a built-in utility. The same applies to desktop platform. From Windows 7 going forward, Windows iSCSI initiator is a built-in utility for free.

©2015 Qsan Confidential. All rights reserved.

Connect to iSCSI target

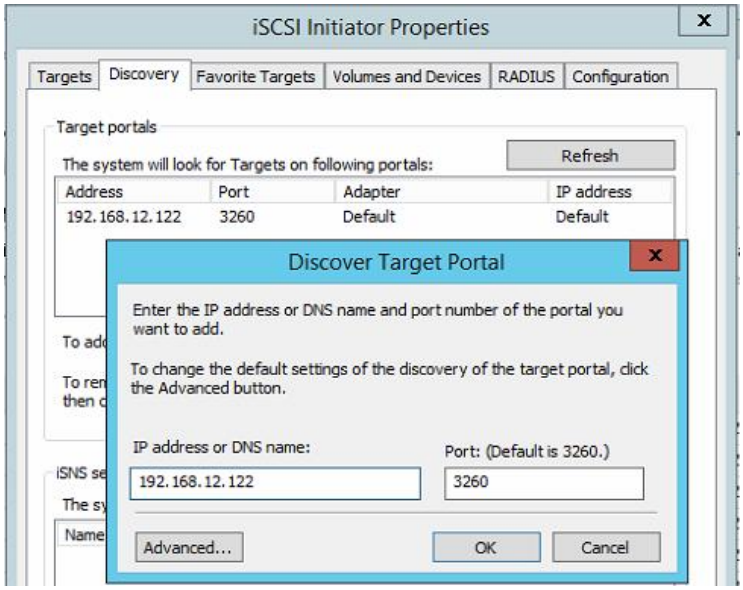


Fig 4-15 Discover iSCSI targets

Launch iSCSI initiator and click on “Discovery” tab. Click “Discover Portal” and put in IP address from one of the network interfaces of controller 1. Check out Fig 4-15 on the left.

Click Ok and click on “Targets” tab. It will automatically discover all iSCSI target nodes (emulated iSCSI targets) on controller 1.

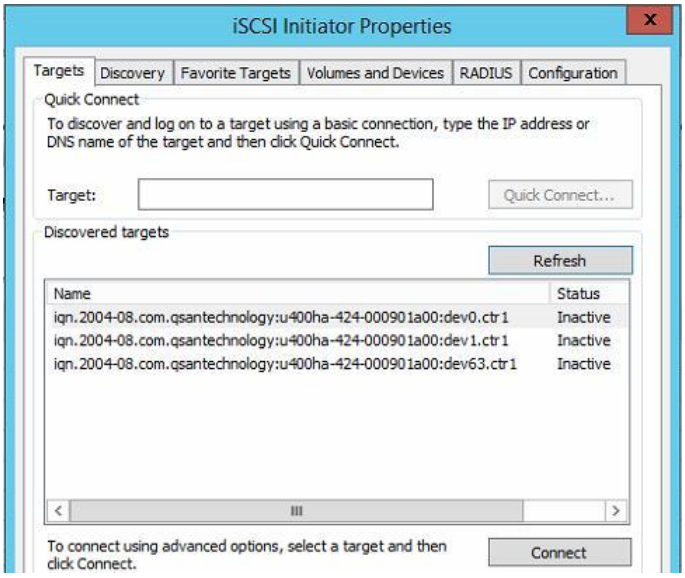


Fig 4-16 Discover iSCSI targets

The other way to locate an iSCSI target is to enter a full iSCSI entity name in “Target” input box in Fig 4-16 on the left. All iSCSI nodes that have at least one LUN attached to it will be discovered and displayed in iSCSI initiator as in Fig 4-16 on the left.

In Fig 4-16, because only 3 nodes have LUNs attached to them. Those 3 iSCSI target nodes will be discovered by iSCSI initiator. Please refer to Fig 4-17 for LUN mapping information.

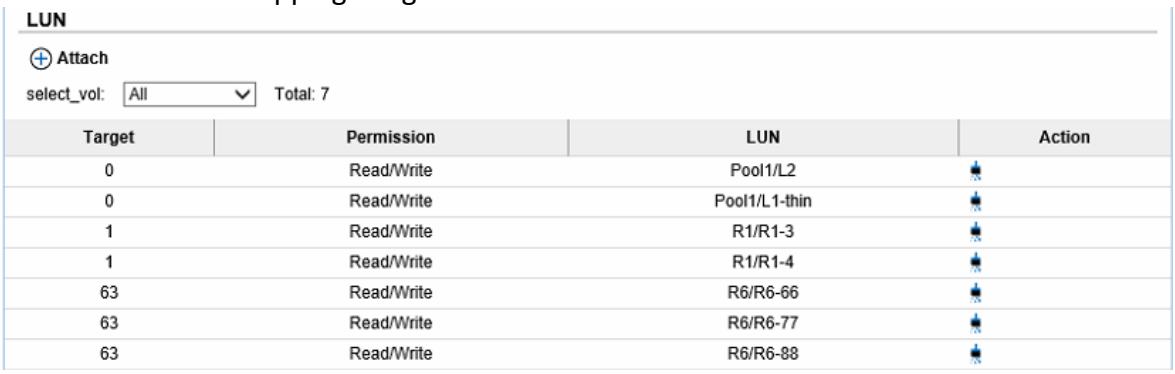
Assume that IP assignment is below.

Controller 1		Controller 2	
LAN1	192.168.12.122	LAN1	192.168.12.142
LAN2	192.168.11.123	LAN2	192.168.11.143
LAN3	192.168.12.124	LAN3	192.168.12.144
LAN4	192.168.11.125	LAN4	192.168.11.145
LAN5	192.168.12.126	LAN5	192.168.12.146
LAN6	192.168.11.127	LAN6	192.168.11.147

The server where iSCSI initiator is running has two network interfaces – 192.168.11.87 (S1) and 192.168.12.86 (S2)

©2015 Qsan Confidential. All rights reserved.

The LUN mapping assignment is below.



Target	Permission	LUN	Action
0	Read/Write	Pool1/L2	
0	Read/Write	Pool1/L1-thin	
1	Read/Write	R1/R1-3	
1	Read/Write	R1/R1-4	
63	Read/Write	R6/R6-66	
63	Read/Write	R6/R6-77	
63	Read/Write	R6/R6-88	

Fig 4-17 LUN mapping demo

Check out iSCSI disks

Assume that we will use the LUNs assigned to iSCSI target node 0. There are two LUNs attached to node 0. After connection completes, we will see two extra disks in Windows server.

Fig 4-18 Connect to Target

Select iSCSI target node 0 and click "Connect" button below Fig 4-18 dialog box will pop up.

Because both controller 1 and 2 can see this LUN. We need to decide the connection path. Let's use server port S1 (11.87) connecting to LAN2 controller 1 (11.123).

Click "Advanced…" button.

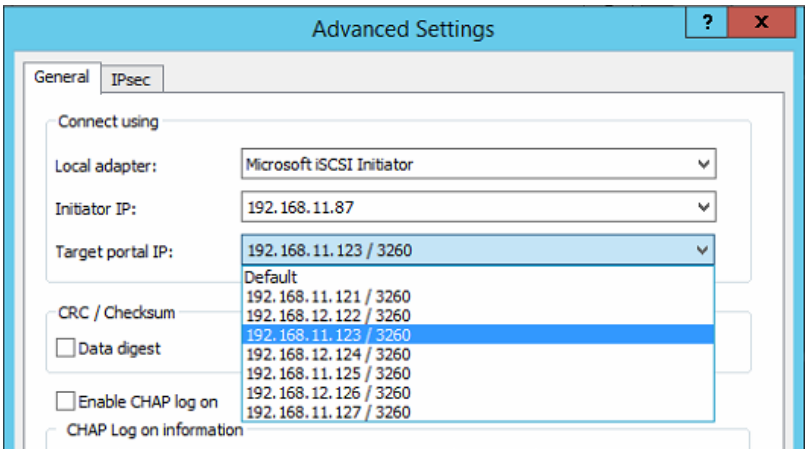


Fig 4-19 Connect to Target

Select "Microsoft iSCSI initiator" for Local adapter.

Select 192.168.11.87 (server port S1) for Initiator IP.
Select 192.168.11.123 (LAN2 controller 1) for Target portal IP.

Click Ok. The connection will be established as Fig 4-20.

©2015 Qsan Confidential. All rights reserved.

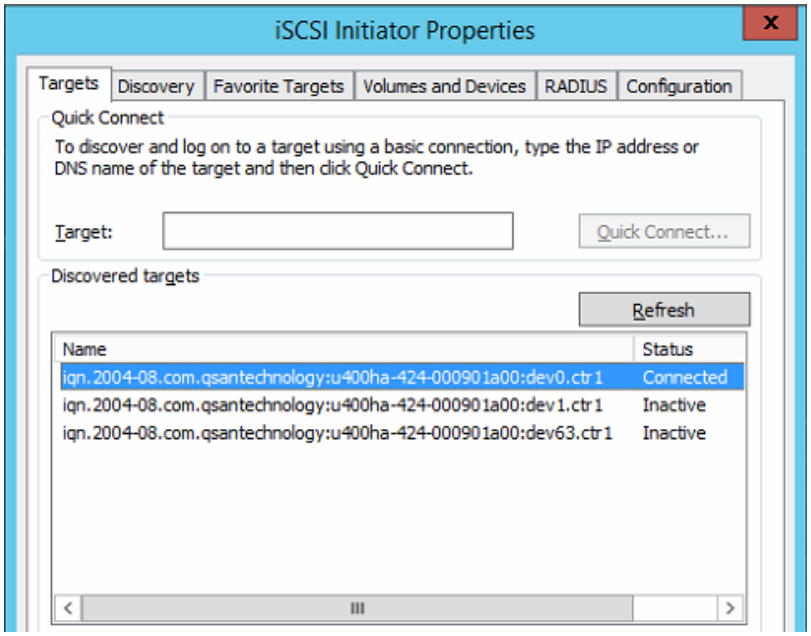
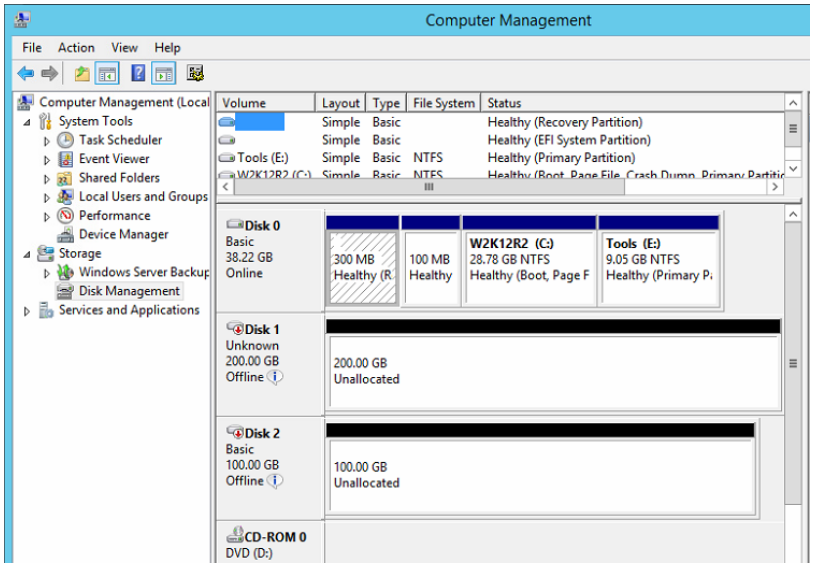


Fig 4-20 Connection completes

From iSCSI initiator dialog box, it shows that the connection is established.

Let's check if the two iSCSI drives are ready for server.

Go to Computer Management in Windows Server 2012. And check out Disk Management.

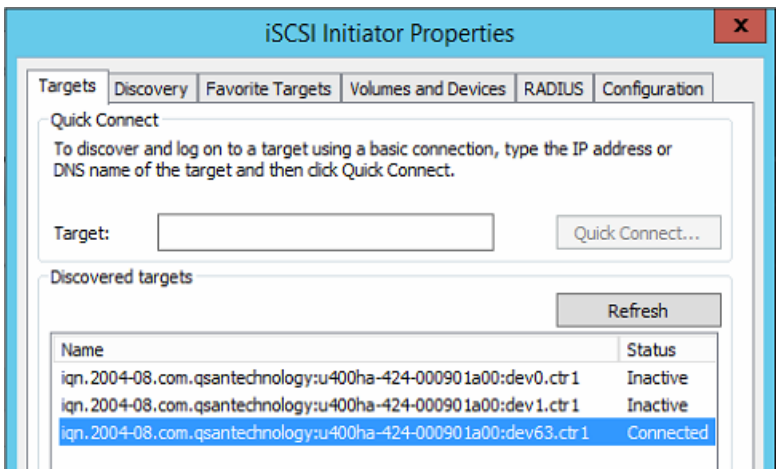


As expected, two new disks are shown in Windows Server 2012. We may start using them just like any newly installed hard drive.

You can check Fig 2-9 for LUN details.

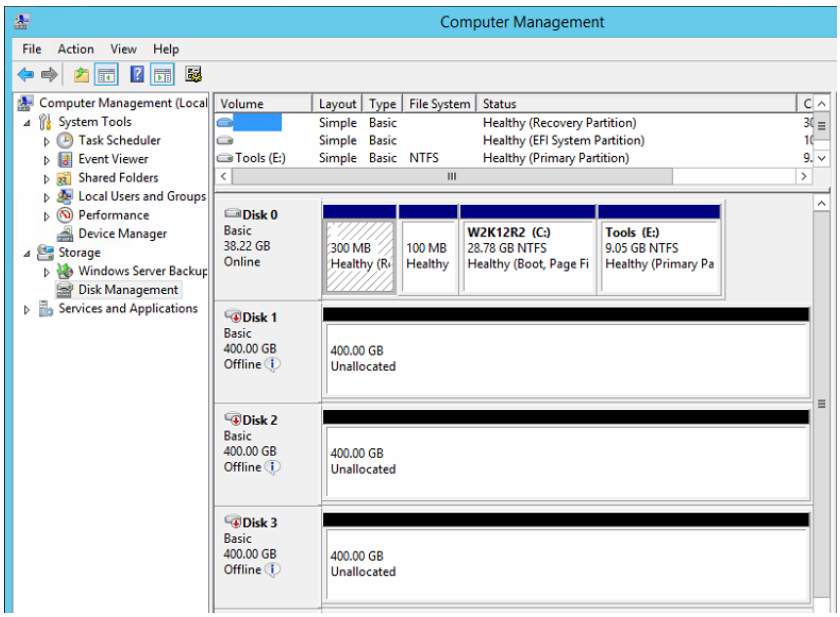
Fig 4-21 New disks in server

So by choosing different iSCSI target nodes, you can use different sets of LUNs attached to those iSCSI target nodes. So we can assign different LUNs to different servers. All servers can share the same storage space in TrioNAS LX HA to achieve maximum efficiency.



Let's disconnect iSCSI target node 0 and connect iSCSI target node 63. The result will look like below.

Fig 4-22 shows that original iSCSI target node 0 has been disconnected. Connect to iSCSI target node 63.



The two drives in Fig 4-21 are gone because iSCSI target node 0 has been disconnected.

The three LUNs attached to iSCSI target node 63 are now shown in server system as Fig 4-23 on the left.

You may check Fig 2-9 for LUN details.

Fig 4-23 Connect to another iSCSI target node

Set MPIO

Before using MPIO, please make sure the MPIO function is enabled in host server. Fig 4-24 below shows the MPIO service in Windows Server 2012. If MPIO service is not enabled in host server, you will see multiple drives that are actually the same LUN in host server.

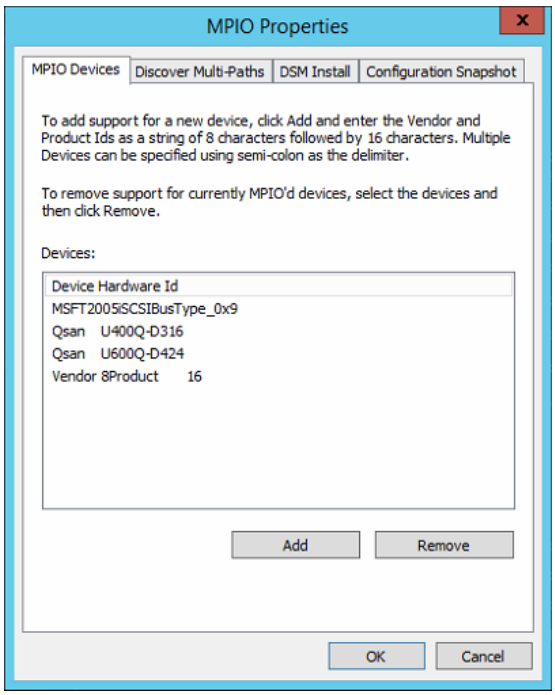

MPIO Properties
MPIO Devices
Discover Multi-Paths
DSM Install
Configuration Snapshot
To add support for a new device, click Add and enter the Vendor and Product Ids as a string of 8 characters followed by 16 characters. Multiple Devices can be specified using semi-colon as the delimiter.
To remove support for currently MPIO'd devices, select the devices and then click Remove.
Devices:
Device Hardware Id
MSFT2005iSCSIBusType_0x9
Qsan U400Q-D316
Qsan U600Q-D424
Vendor 8Product 16
Add
Remove
OK
Cancel

Fig 4-24 MPIO service in Windows Server 2012

©2015 Qsan Confidential. All rights reserved.

Set up MPIO with one controller. Because each RAID controller has multiple network ports, we can use MPIO function to increase the overall I/O bandwidth. Example below shows to set up iSCSI target node 0 using two paths.

Path 1 : server s1 (11.87) to LAN4 controller1 (11.125)
Path 2 : server s2 (12.86) to LAN1 controller1 (12.122)

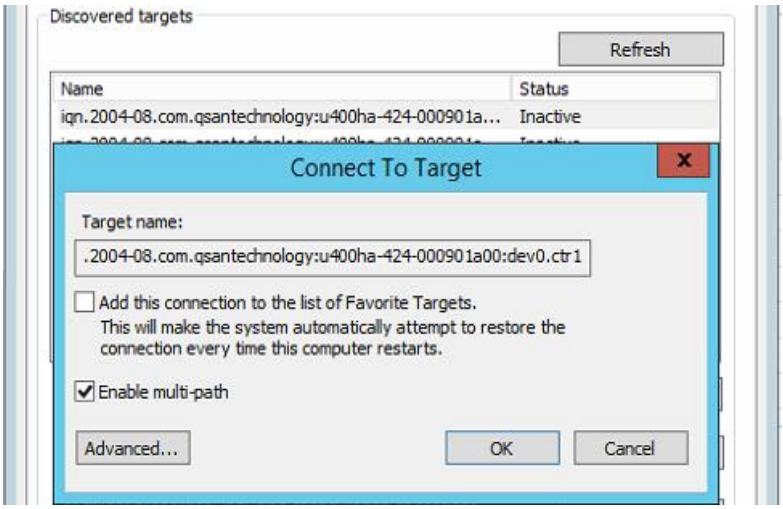


Fig 4-25 Set up MPIO

Select iSCSI target node 0 and click "Connect" button. Fig 4-25 dialog box will pop up.

Check "Enable multi-path" and click "Advanced…" button.

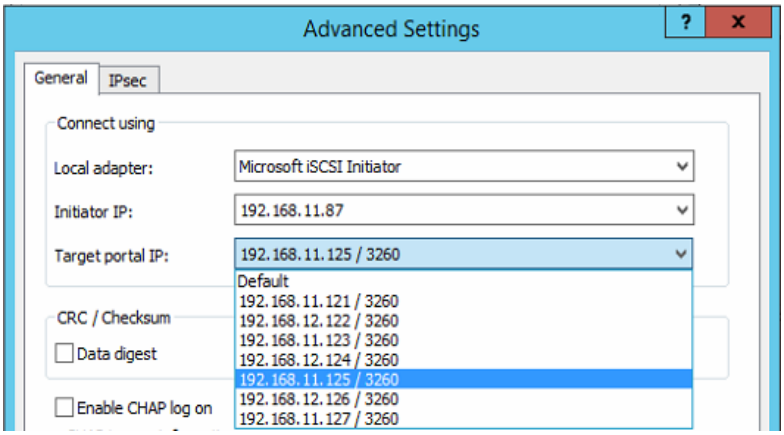


Fig 4-26 Create Path 1

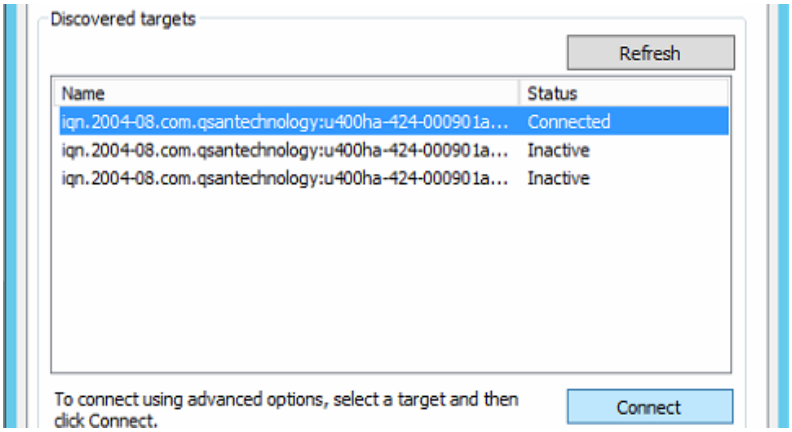
Create Path1.

Select iSCSI initiator for Local adapter.

Select 192.168.11.87 for Initiator IP.

Select 192.168.11.125 for Target portal IP.

Click Ok to establish the connection.

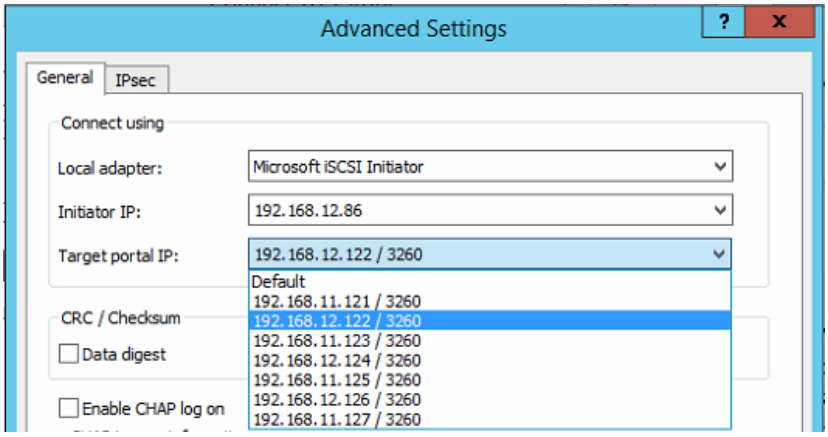


Select iSCSI target node 0 **again** and click "Connect" button. It's connected now.

Create Path2.

Again, check "Enable multi-path" and click "Advanced…" button.

©2015 Qsan Confidential. All rights reserved.



Select iSCSI initiator for Local adapter.

Select 192.168.12.86 for Initiator IP.

Select 192.168.12.122 for Target portal IP.

Click Ok to establish the connection.

Fig 4-27 Create Path 2

Now there are two paths to iSCSI target node 0 with bandwidth of 2Gb/s. When accessing those two LUNs, the speed will be faster compared to that in the previous section.

To verify if MPIO is in action, select iSCSI target node 0 and click “Properties” button. There are two paths shown in Fig 4-28 below.

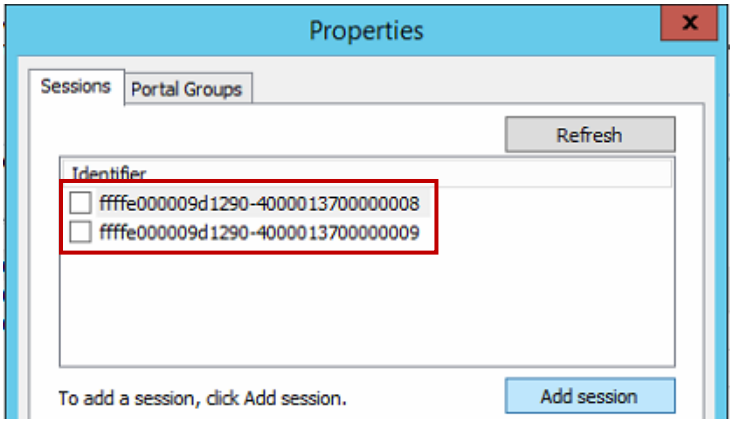


Fig 4-28 Multiple session (paths)

©2015 Qsan Confidential. All rights reserved.

Set up MPIO with two controllers. This is how to use high availability function of dual active-active controller mode. We will set up one path from each controller. To see the iSCSI target nodes from controller 2, put in the IP address of controller 2 to discover the iSCSI target nodes.

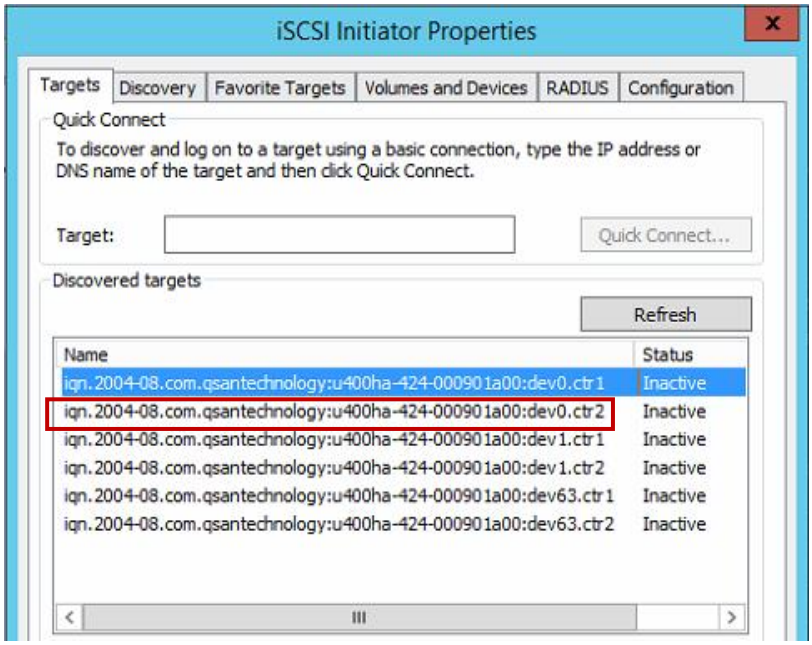


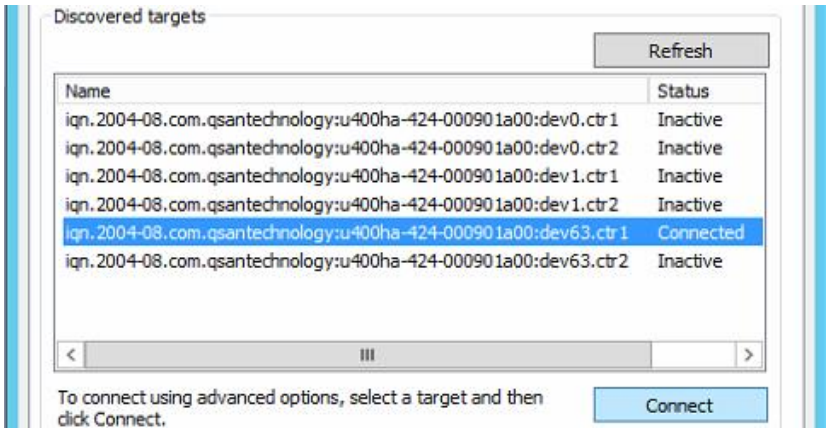
Fig 4-29 iSCSI targets from both controllers

As Fig 4-29 shown, iSCSI target nodes from controller 2 are displayed as well.

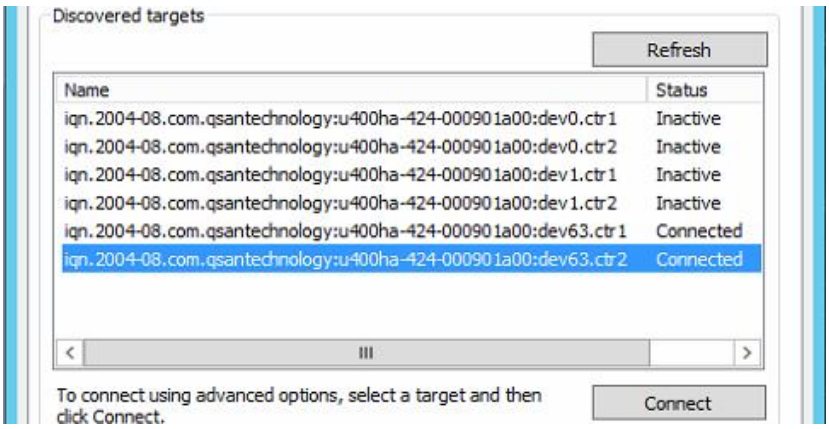
Let's construct two paths to both controllers to the same iSCSI target node 63.

Path1 to ctr1
server s1 (11.87) to LAN2 ctr1 (11.123)
Path2 to ctr1
server s2 (12.86) to LAN3 ctr1 (12.124)
Path3 to ctr2
server s1 (11.87) to LAN6 ctr1 (11.147)
Path2 to ctr2
server s2 (12.86) to LAN5 ctr1 (12.146)

Please follow the same concept and steps from previous section to create these four paths.



Select iSCSI target node 63 from controller 1 and create MPIO.



Select iSCSI target node 63 from controller 2 and create MPIO.

©2015 Qsan Confidential. All rights reserved.

Done. Now you can use the LUNs from iSCSI target node 63 with controller failover protection and increased bandwidth. As in Fig 4-30, host server can now use the three LUNs attached to iSCSI target node 63.

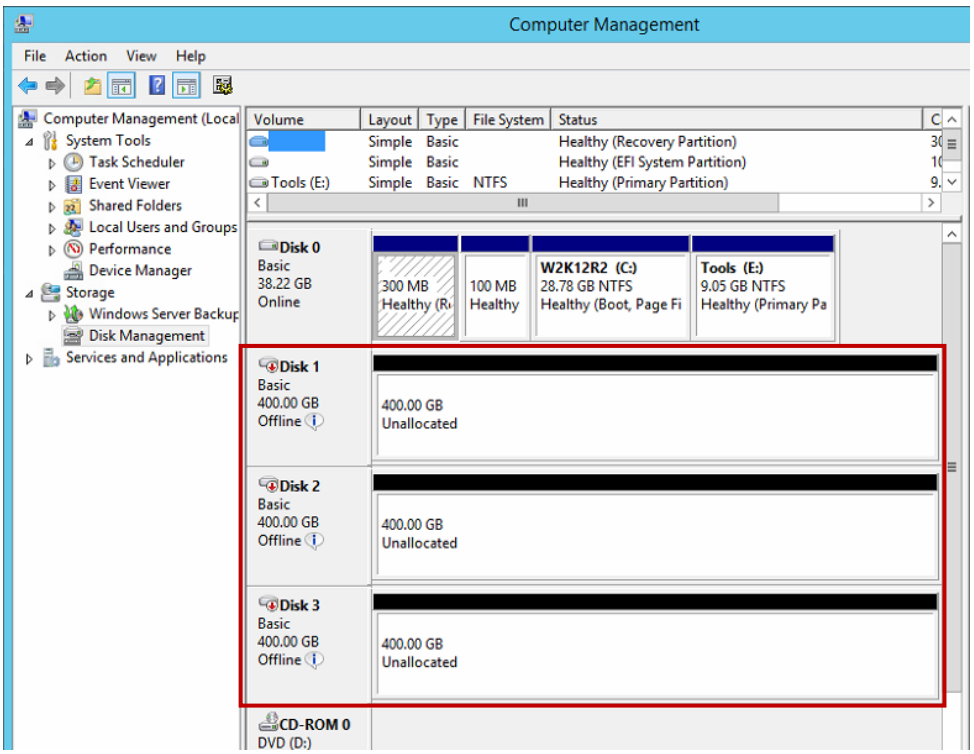
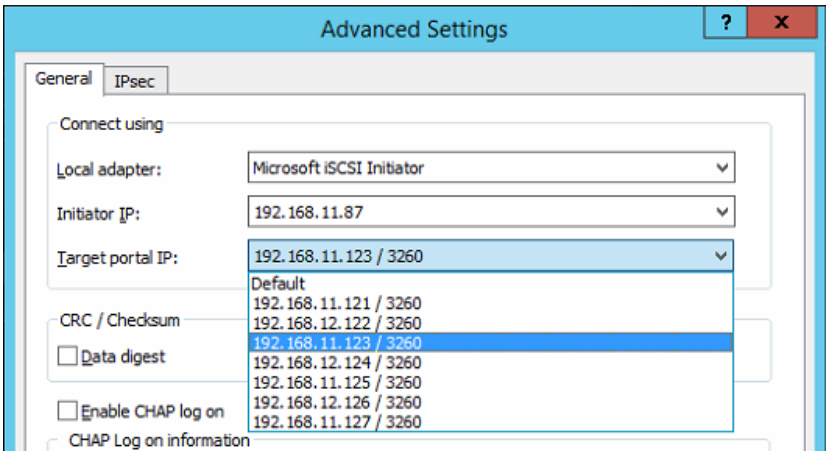


Fig 4-30 Three LUNs attached to iSCSI target node 63

Set MC/S

The way to construct MC/S is similar to MPIO, but it goes through different UI in iSCSI initiator. Let's use iSCSI target node 0 for example. First, we create connection to iSCSI target node 0 through path-A.

Path-A : server port s1 (11.87) to LAN2 controller1 (11.123)



Select iSCSI initiator for Local adapter.

Select 192.168.11.87 for Initiator IP.

Select 192.168.11.123 for Target portal IP.

Click Ok to establish the connection.

©2015 Qsan Confidential. All rights reserved.

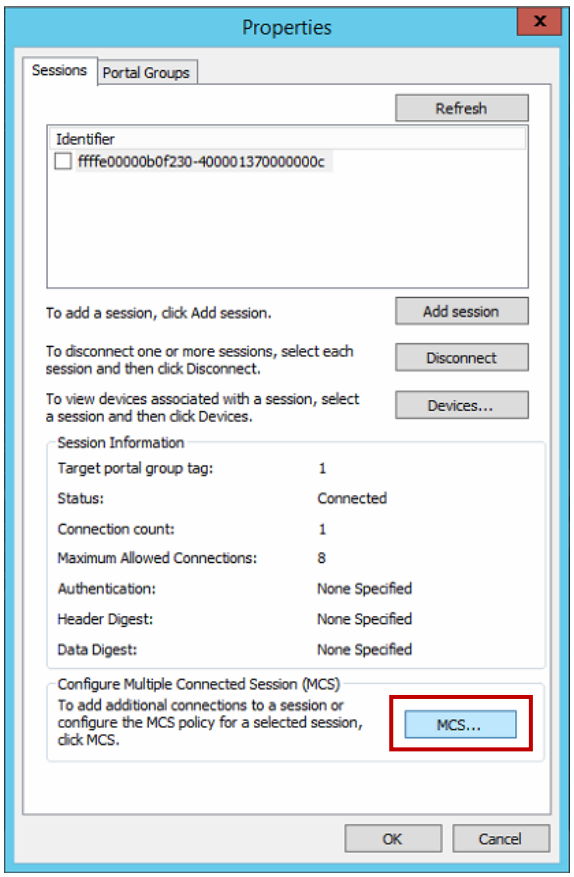
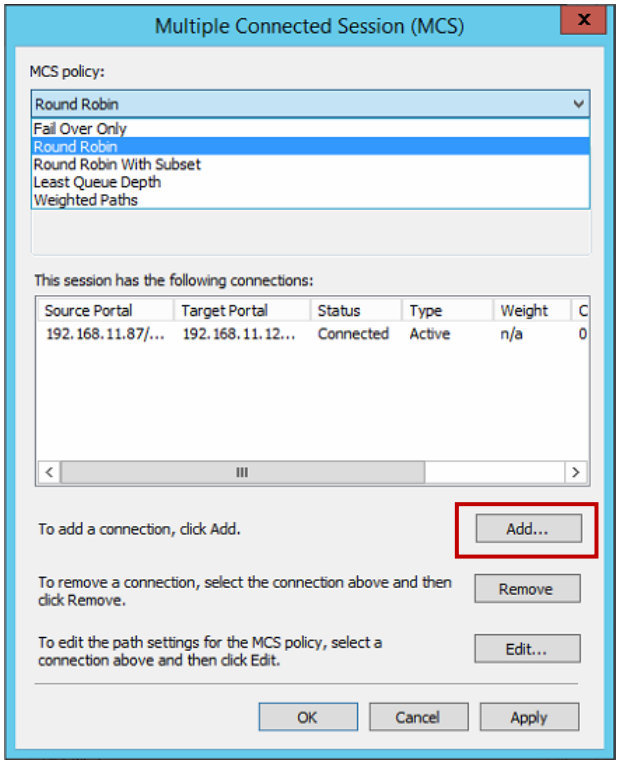


Fig 4-31 iSCSI connection properties

Select iSCSI target node 0 and click “Property” button.

In Fig 4-31 on the left, “Add session” button is where to add extra path to construct MPIO connection.

Click “MCS…” button at the bottom of Fig 4-31 to start constructing MC/S connections.

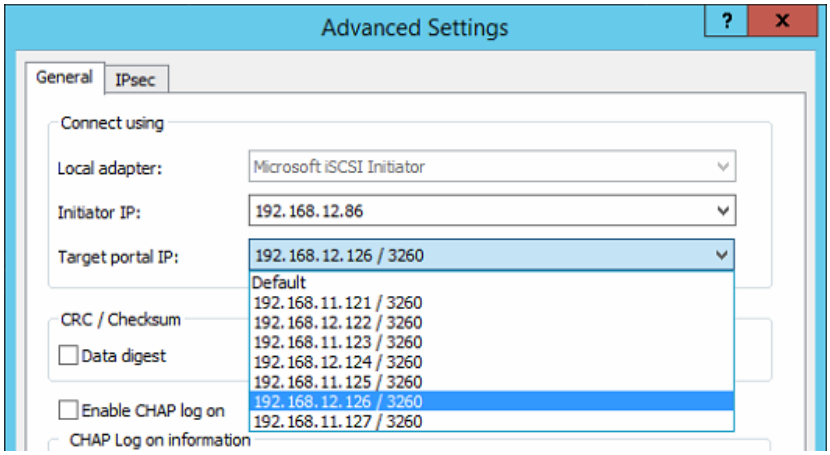


From MCS drop-down list, select the policy that fits your requirement.

Click “Add…” button to add more connections to the session.

Click “Advanced…” and it pops up the same dialog box as we did in the previous MPIO section.

©2015 Qsan Confidential. All rights reserved.



Select the required connection you want to establish.

Click “Ok” and click “Connect”.

In Fig 4-32 below, you will see added connection to this session.

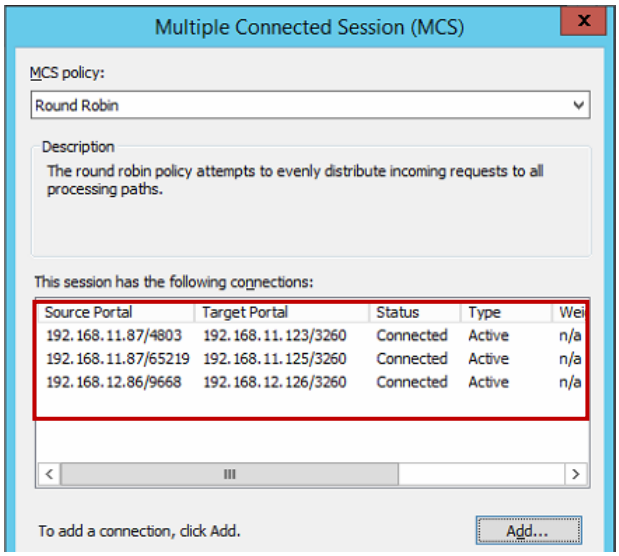


Fig 4-32 MC/S connections

Fig 4-32 on the left shows that there are 3 connections established.

Click Ok to complete creating MC/S connection.

Disconnect iSCSI target

Disconnecting iSCSI connection is easy. Simply select the iSCSI target node and click “Disconnect” button.

©2015 Qsan Confidential. All rights reserved.

iSCSI and Linux iSCSI initiator

Installation

Before configuring the iSCSI multipath, you have to install the following rpm packages and source files (.tar.gz), so that the iSCSI service could run smoothly and without any compatible issues. Here is the order to install the packages we need:

- iscsi-initiator-utils-6.2.0.873-10.el6.x86_64.rpm
- device-mapper-1.02.79-8.el6.x86_64.rpm
- device-mapper-multipath-0.4.9-72.el6.x86_64.rpm

All the necessary rpm packages can be found in the RHEL6.5 DVD, Install them as follows:

```
# rpm -ivh /media/”RHEL_6.5 x86_64 Disc 1”/Packages/iscsi-initiator-utils-6.2.0.873-10.el6.x86_64.rpm
]# rpm -ivh /media/”RHEL_6.5 x86_64 Disc 1”/Packages/device-mapper-1.02.79-8.el6.x86_64.rpm
# rpm -ivh /media/”RHEL_6.5 x86_64 Disc 1”/Packages/device-mapper-multipath-0.4.9-72.el6.x86_64.rpm
```

How to use Linux iSCSI initiator

The iSCSI initiator name can be specified in the configuration file /etc/iscsi/initiatorname.iscsi.

```
# vi /etc/iscsi/initiatorname.iscsi
InitiatorName = Your_initiator_name
```

Edit the configuration file of iSCSI initiator in /etc/iscsi/iscsid.conf, the iscsi session timeout value has to be changed to a proper value. The default value is 120 seconds, but it is too long to keep the I/O wait before the path is judged as fail and it may cause the I/O failure. Please set a shorter and proper timeout value in this configuration file.

```
# vi /etc/iscsi/iscsid.conf
node.session.timeo.replacement_timeout = 30
(Please set a proper timeout value)
```

In /etc/iscsi/iscsid.conf, it also provides others settings, such as:

©2015 Qsan Confidential. All rights reserved.

```
# vi /etc/iscsi/iscsid.conf
node.startup = Automatic
(Set auto-login when discover target)
node.session.auth.authmethod = CHAP
(Enable CHAP auth)
node.session.auth.username = username
(Set CHAP username)
node.session.auth.password = password
(Set CHAP password)
```

Please restart the iSCSI service to make these changes work.

```
# service iscsi restart
```

The rpm package iscsi-initiator-utils provides a command line tool called iscsiadm. It can manage the connections to iSCSI target. The iscsiadm tool has three operational modes - discovery, node, and session. The following will introduce these modes.

1. Discovery the all port and target name by # iscsiadm -m discovery. Operational mode -discovery is used to discover the target, the usage is
   # iscsiadm -m discovery -t st -p target_ip

```
# iscsiadm -m discovery -t st -p 10.10.10.100
192.168.1.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
192.168.2.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
10.10.10.100:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
192.168.4.1:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
# iscsiadm -m discovery -t st -p 192.168.195.22
192.168.5.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
192.168.6.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
192.168.195.22:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
192.168.8.1:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
```

2. Users can login and logout by # iscsiadm -m node with the ip and target name. Operational mode -node is used to login/logout, the usage is
   # iscsiadm -m node -T target_iqn -p target_ip –l
   # iscsiadm -m node -T target_iqn -p target_ip –u

```
# iscsiadm -m node -T iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1 -p
10.10.10.100 -l
```

©2015 Qsan Confidential. All rights reserved.

```
(login 10.10.10.100)
# iscsiadm -m node -T iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2 -p
192.168.195.22 -l
(login 192.68.195.22)
# iscsiadm -m node -T iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1 -p
10.10.10.100 -u
(logout 10.10.10.100)
# iscsiadm -m node -T iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2 -p
192.168.195.22 -u
(logout 192.168.195.22)
```

3. Query the list of nodes, the usage is
   # iscsiadm -m node

```
# iscsiadm -m node
192.168.1.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
192.168.2.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
10.10.10.100:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
192.168.4.1:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
192.168.5.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
192.168.6.1:3260,0 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
192.168.195.22:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
192.168.8.1:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
```

4. If users want to clear the node list, the usage is
   # iscsiadm -m node -0 delete

5. This command will list the connected iSCSI session, it can be expressed as
   # iscsiadm -m session

```
# iscsiadm -m session
tcp: [3] 10.10.10.100:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1
tcp: [4] 192.168.195.22:3260,1 iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr2
```

6. In session mode, the iSCSI session can be logout, the usage is
   # iscsiadm -m session -r session_id –u

```
# iscsiadm -m session -r 3 -u
Logging out of session [sid: 3, target: iqn.2004-08.com.qsantechnology:p600q-d316-000901d0
0:dev0.ctr1, portal: 10.10.10.100]
```

©2015 Qsan Confidential. All rights reserved.

```
Logout of [sid: 3 target: iqn.2004-08.com.qsantechnology:p600q-d316-000901d00:dev0.ctr1, p
ortal: 10.10.10.100,3260]: successful
```

7. To log out all sessions, the usage is
   # iscsiadm -m session –u

How to set up DM-Multipath

The procedures of setup a multipath DM-Multipath are on the following.
To enable mpathconf, and then enable multipath support.

```
# mpathconf -h
usage: /sbin/mpathconf <command>

Commands:
Enable: --enable
Disable: --disable
Set user_friendly_names (Default n): --user_friendly_names <y|n>
Set find_multipaths (Default n): --find_multipaths <y|n>
Load the dm-multipath modules on enable (Default y): --with_module <y|n>
start/stop/reload multipathd (Default n): --with_multipathd <y|n>
chkconfig on/off multipathd (Default y): --with_chkconfig <y|n>
# mpathconf --enable
(It will create multipath.conf file as the configuration of multipath)
# service multipthd start
(To enable multipath)
```

How to exclude local disks

There are two ways that the local disks can be excluded when generating multipath devices.

1. Determine which WWN of local disks will be ignored. In this example, using the command multipath can find out the WWN of local disk /dev/sda
   The WWN of local disk /dev/sda is in the parenthesis followed by the word “mpatha”.

```
# multipath -F
(Clear all multipath device maps)
# multipath
```

©2015 Qsan Confidential. All rights reserved.

```
(Create multipath)
create: mpatha(1ATA    ST31000528AS                    9V)undef ATA,ST31000528A
[size=932G feature='0' hwhandler='0' wp=undef
'-+- policy='round-robin 0' prio=1 status=undef
'- 2:0:0:0  sda8:0   undef ready running
create: mpathb (3203300137890ad00) undef Qsan,p600-d316
[size=500g feature='0' hwhandler='0' wp=undef
|-+- policy='round-robin 0' prio=1 status=undef
| '- 12:0:0:0 sdb 8:16 undef ready running
'-+- policy='round-robin 0' prio=1 status=undef
'- 13:0:0:0 sdc 8:32 undef ready running
```

TIP: The device A as follow means failover. And another one means round-robin.

A. |-+- policy='round-robin 0' prio=1 status=undef
   | '- 12:0:0:0 sdb 8:16 undef ready running
   '-+- policy='round-robin 0' prio=1 status=undef
   '- 13:0:0:0 sdc 8:32 undef ready running

B. |-+- policy='round-robin 0' prio=1 status=active
   '- 12:0:0:0 sdb 8:16 active ready running
   '- 13:0:0:0 sdc 8:32 active ready running

2. Edit /etc/multipath.conf, and insert the WWN of local disk into the blacklist.

```
# vi /etc/multipath.conf
blacklist {
wwid 1ATA    ST31000528AS                    9V
}
```

TIP: If you change the value of multipath.conf, you must restart multipath to take effect.

```
# service multipthd restart
```

3. User can also change the find_multipths to block the local disk

```
# multipath -find_multipaths y

OR
# vi /etc/multipath.conf
defaults{
find_multipaths yes
}
```

©2015 Qsan Confidential. All rights reserved.

Next, the alias of iSCSI device will be created. The alias name will help iSCSI device to be identified easily. Find the UUID of iSCSI device in Red below:

```
# multipath -ll
mpathb (32033001378901d00) dm-3 Qsan,p600-d316
[size=500g feature='0' hwhandler='0' wp=rw
|-+- policy='round-robin 0' prio=1 status=active
| '- 12:0:0:0 sdb 8:16 active ready running
'-+- policy='round-robin 0' prio=1 status=enabled
'- 13:0:0:0 sdc 8:32 active ready running
```

1. Edit the /etc/multipath.conf again:

```
# vi /etc/multipath.conf
multipaths {
        multipath {
                wwid 32033001378901d00
                alias qsan
                path_grouping_policy multibus
#                path_checker direction
                (This line may cause multipath be invalid in different device)
                path_selector "round-robin 0"
                failback manual
                rr_weight priorities
                no_path_retry 5
}
```

2. Save the configuration file, and confirm that the persistent name to iSCSI device has been created.

```
# multipath -ll
qsan (32033001378901d00) dm-3 Qsan,p600-d316
[size=500g feature='1 queue_if_no_path' hwhandler='0' wp=ro
|-+- policy='round-robin 0' prio=1 status=active
'- 12:0:0:0 sdb 8:16 active ready running
'- 13:0:0:0 sdc 8:32 active ready running
# ls -l /dev/mapper
total 0
crw-rw---- 1 root root  10, 58 jul 28 18:34 control
lrwxrwxrwx 1 root root       7 jul 28 18:34 qsan -> ../dm-3
```

©2015 Qsan Confidential. All rights reserved.

```
lrwxrwxrwx 1 root root      7 jul 28 18:34 VolGroup00-lv_home -> ../dm-2
lrwxrwxrwx 1 root root      7 jul 28 18:34 VolGroup00-lv_root -> ../dm-0
lrwxrwxrwx 1 root root      7 jul 28 18:34 VolGroup00-lv_swap -> ../dm-1
```

TIP: Usually it uses the command multipath to manage the multipath devices. Here is the parameter manual.

multipath	Without parameters, create the devmaps for the multipath devices.
-h	Print this usage text.
-l	Show multipath topology. (sysfs and DM info)
-ll	Show multipath topology. (maximum info)
-f	Flush a multipath device map.
-F	Flush all multipath device maps.
-c	Check if advice should be a path in a multipath device.
-q	Allow queue_if_no_path whenmultipathd is not running.
-d	Dry run, do not creat or update devmaps.
-r	Force devmap reload.
-p	Policy failover|multibus|group_by_serial|group_by_prio.
-b fil	Bindings file location.
-p pol	Force all maps to specified path grouping policy: failover 1 path per priority group multibus all paths in 1 priority group group_by_serial 1 priority group per serial group_by_prio 1 priority group per priority level group_by_node_name 1 priority group per target node
-v lvl	Verbosity level: 0 no output 1 print created devmap names only 2 default verbosity 3 print debug information
Dev	Action limited to: Multipath named 'dev' (ex: mpath0) or Multipath whose wwidis 'dev' (ex:60051..) Multipath including the path named 'dev' (ex: /dev/sda) Multipath including the path with maj:min 'dev' (ex:8:0)

©2015 Qsan Confidential. All rights reserved.

5 Manage user, group, and domain

This chapter introduces how to create and manage user accounts and group accounts. Directory services such as Active Directory and LDAP will be explained as well. We will explain why UnifiedAUTH is so helpful and important to enterprise users. Sections included in this chapter are :

- Local account management
- UnifiedAUTH built-in service
- Active Directory management
- LDAP management

Local account management

Local user account

Local account means the users and groups that are valid in and belong to this individual TrioNAS LX HA system. The default accounts are “admin” and “guest”. For IT managers, please always use “admin” account to configure Qsan NAS systems.
Go to “Privilege setting -> Accounts -> User” to start creating user accounts. The meaning of each item in Fig 5-1 is described below.

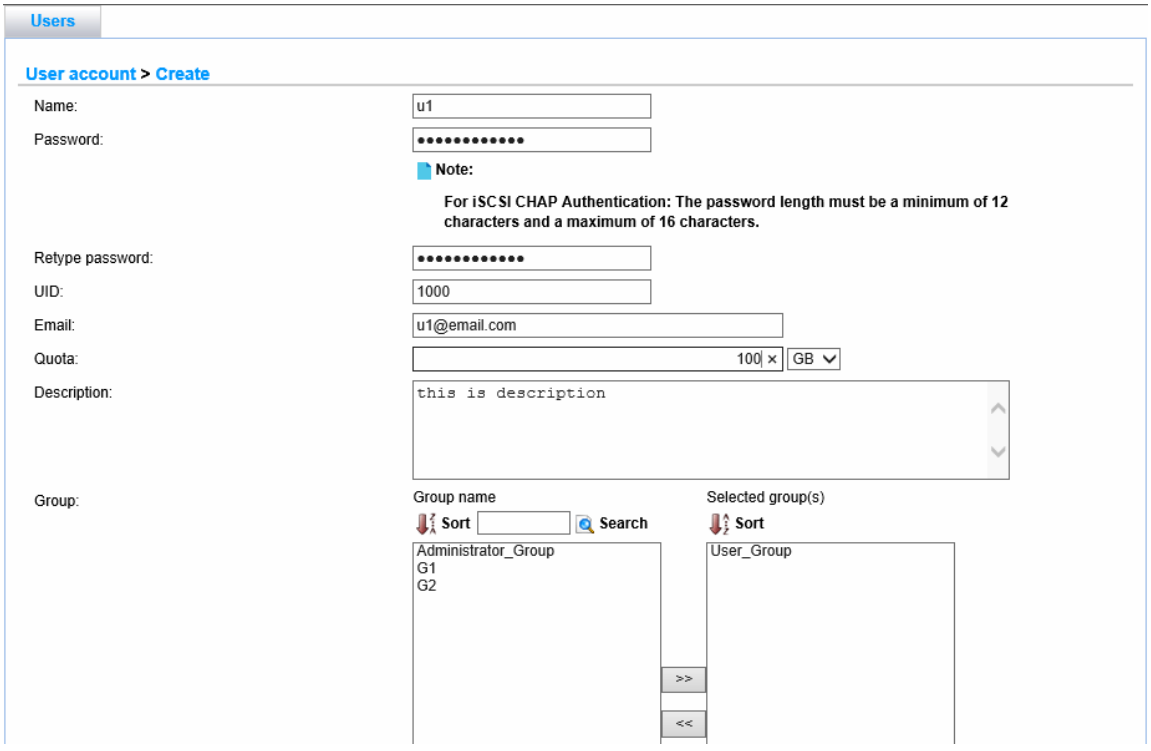


Fig 5-1 Create local user account

©2015 Qsan Confidential. All rights reserved.

Item name	Description
Name	User account name. Up to 32 characters. It must start with a letter. It is case-sensitive. Allowed characters : alphanumeric characters plus _ and .
Password	12 to 16 alphanumeric characters. Case sensitive. Because UnifiedAUTH function is built-in, the password needs to comply with iSCSI CHAP password rule as well. The minimum length is required to be 12.
Retype password	Password confirmation.
UID	User ID for Linux and Unix applications.
Email	User's email for event notification purpose.
Quota	Personal share quota in UserHome directory.
Description	A brief comment for the account.
Group	Select the groups that this user account belongs to. It can be multiple choices.

Fig 5-2 provides a full view of user account page. You can edit, change password, and delete the account for management purpose. Local accounts and domain accounts are displayed separately by selecting the drop-down list Local user. Both local and domain accounts can co-exist for share authentication. Domain account information in the table is only for display purpose. You cannot edit domain account or change the password of domain account.

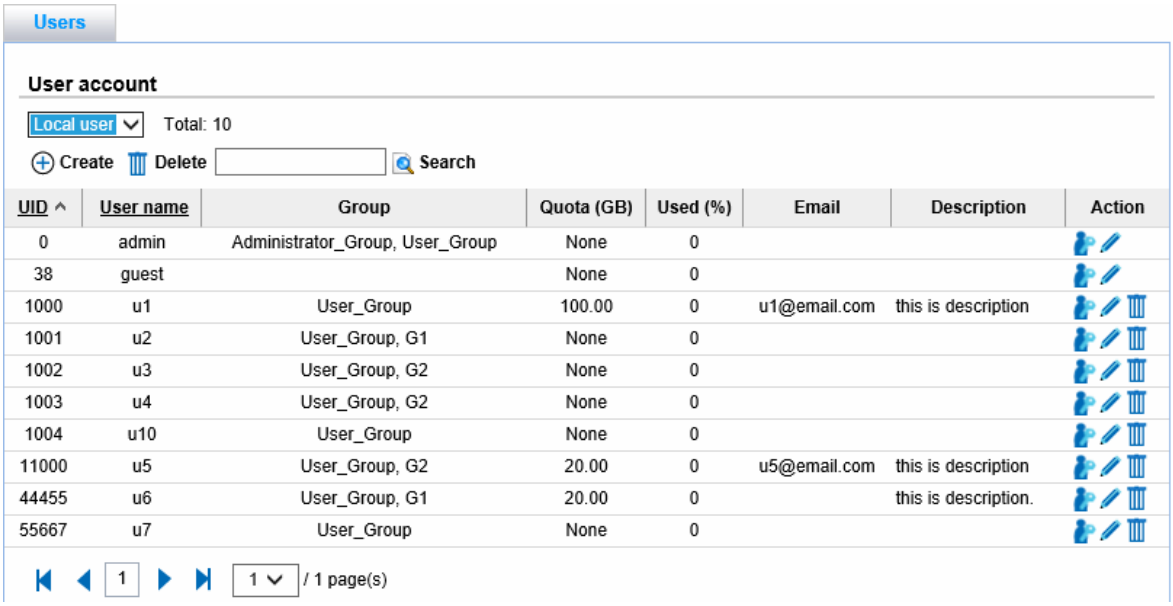


Fig 5-2 User account table

	TIP	Both local and domain accounts can co-exist at the same time for both user and group. But in LDAP, local accounts do NOT work. Only LDAP accounts work.

©2015 Qsan Confidential. All rights reserved.

Local group account

These group accounts belong to the NAS machine locally. It's the same thing in Linux. Users in the same group share the same access rights of a volume. Go to "Privilege setting -> Accounts -> User groups" to start creating group accounts. The meaning of each item in Fig 5-3 is described below.

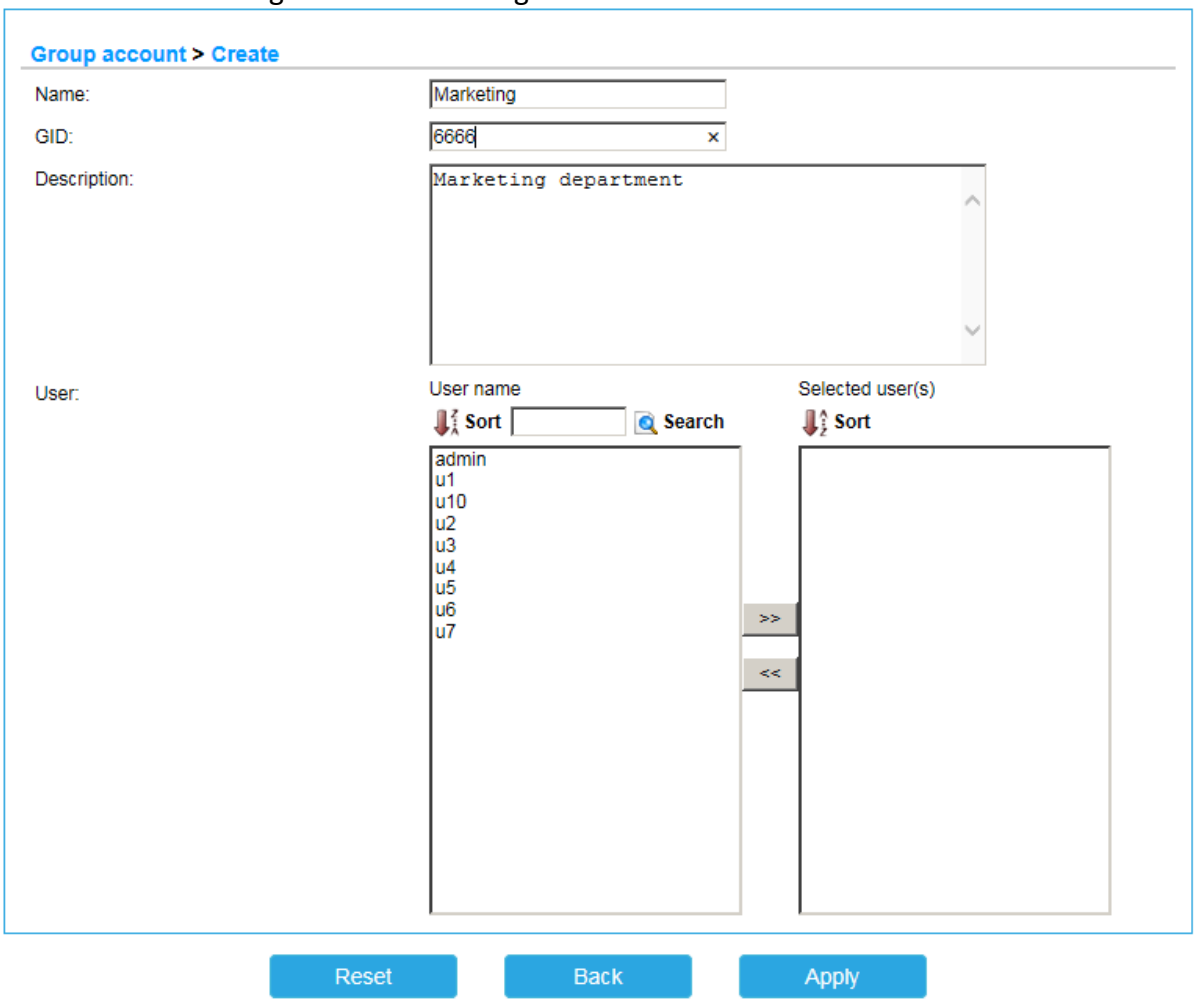


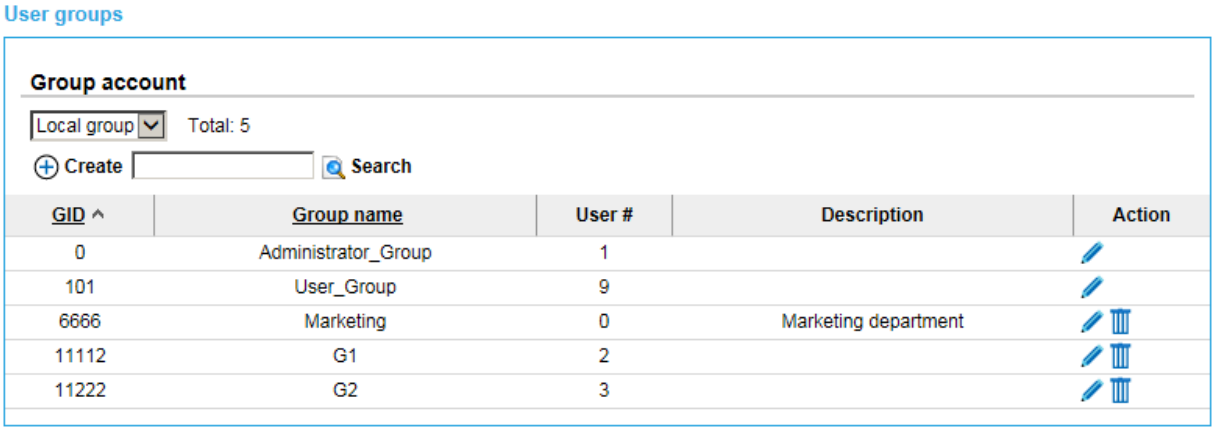
Fig 5-3 Create local group

Item name	Description
Name	Group name. Up to 128 characters. It must start with a letter. It is case-sensitive. Allowed characters : alphanumeric characters plus _ and .
GID	Assign a specific group ID within the range of 1000 ~ 60000. If GID is left blank, the NAS system will automatically assign an ID.
Description	A brief comment for the account.
User	Organize the content of the group and select the users to join the group. The user list is displayed in either ascending or descending order. Click "Search" button to search the user if the user list is very long.

Click "Apply" button to commit the changes.

©2015 Qsan Confidential. All rights reserved.

Fig 5-4 below shows a full view of the group page. You can edit and delete the account for management purpose. Local accounts and domain accounts are displayed separately by selecting the drop-down list Local group. Both local and domain accounts can co-exist for share authentication. Domain accounts information in the table is only for display purpose. You cannot edit domain account or delete it.



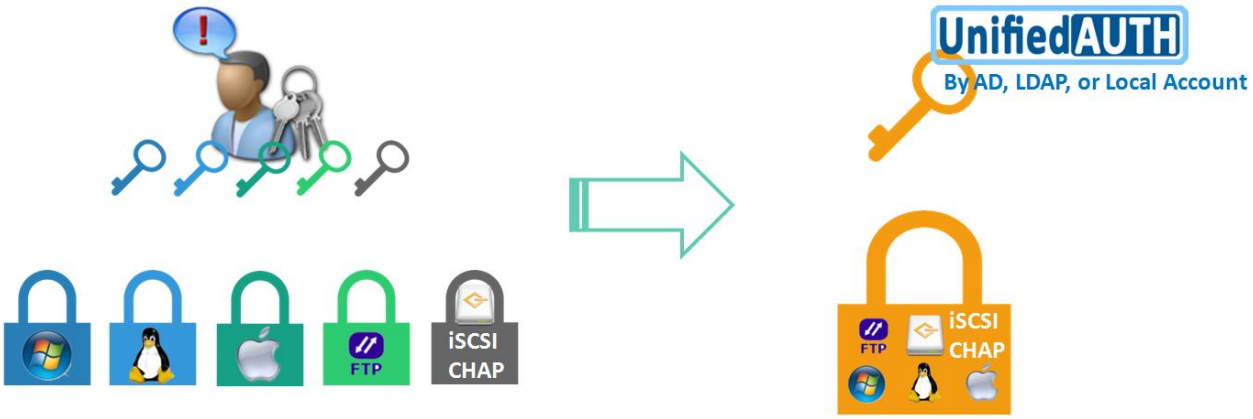
GID	Group name	User #	Description	Action
0	Administrator_Group	1		
101	User_Group	9		
6666	Marketing	0	Marketing department	
11112	G1	2		
11222	G2	3		

Fig 5-4 Group account table

UnifiedAUTH function

UnifiedAUTH is Qsan patented function. It means unified authentication, which is to allow all data services provided in TrioNAS LX HA use the same set of accounts for authentication purpose. UnifiedAUTH removes the troubles of using different accounts for different data services. For example, CIFS service uses Active Directory account. NFS service uses local account. iSCSI service uses CHAP account. Without UnifiedAUTH, a user needs to memorize three different accounts/passwords in order to access data using different data services.

In TrioNAS LX HA, the same local and domain account can be used by all data services (CIFS, NFS, iSCSI). It's built-in as default so there is no setting in web UI management. You can experience the benefits it brings you when you use all data services at the same time.



©2015 Qsan Confidential. All rights reserved.

Active Directory management

TrioNAS LX HA can integrate seamlessly with Windows Active Directory service, which comes from Windows Server 2003 and beyond. Trust types support parent-child, two-way trust. Certain requirements are needed to set up and join AD domain correctly.

- Primary DNS (Domain Name Server) setting is identical to that of the Active Directory server.
- The system time is synchronous with that of the Active Directory server with less than 1 minute tolerance.

Only one directory service can be enabled at all time. No two directory services can be enabled at the same time. Switching directory service will result in losing Access Control List of all shares from the previous directory service.

Go to “Privilege setting -> Accounts -> Directory services” and select “Active directory”. “Standalone” is the default setting, which means that the NAS system does not join any domain or directory service.

Fig 5-5 below will pop up after selecting “Active directory”.

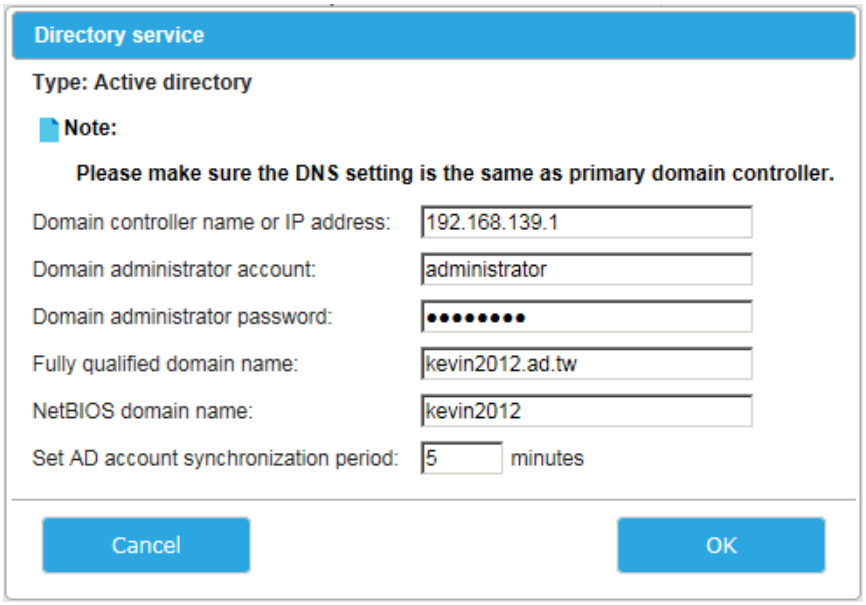


Fig 5-5 Active directory login page

Please enter correct data for each entry and click “Ok” to start logging into the domain. Fig 5-6 shows the related information of this Active Directory server. Please be aware of the FQDN entry to exclude the actual computer name. Using the actual computer name will cause login process failed.

AD account synchronization period is set as 5 minutes. It means that TrioNAS LX HA will ask Active Directory server every 5 minutes for updated information such as new accounts, deleted accounts, password changes …etc.

©2015 Qsan Confidential. All rights reserved.

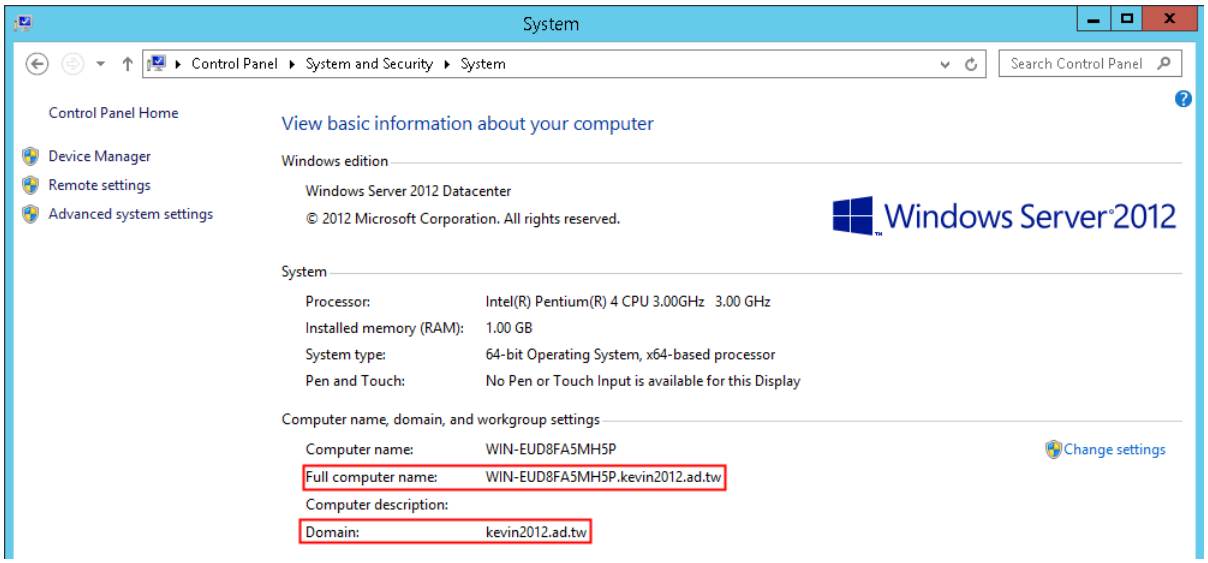
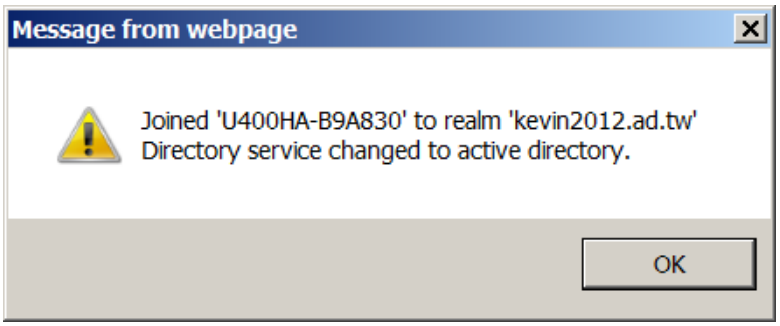

System
Control Panel ▸ System and Security ▸ System
Search Control Panel
Control Panel Home
Device Manager
Remote settings
Advanced system settings
View basic information about your computer
Windows edition
Windows Server 2012 Datacenter
© 2012 Microsoft Corporation. All rights reserved.
Windows Server 2012
System
Processor: Intel(R) Pentium(R) 4 CPU 3.00GHz 3.00 GHz
Installed memory (RAM): 1.00 GB
System type: 64-bit Operating System, x64-based processor
Pen and Touch: No Pen or Touch Input is available for this Display
Computer name, domain, and workgroup settings
Computer name: WIN-EUD8FA5MH5P
Change settings
Full computer name: WIN-EUD8FA5MH5P.kevin2012.ad.tw
Computer description:
Domain: kevin2012.ad.tw

Fig 5-6 Windows Server that runs Active Directory service.

It will take a few minutes to complete the login process. If there are over thousands of accounts, it will take even longer. When it's done, the following dialog box will pop up to notify that it's done.



Go back to user account page or group account page. From the drop-down list, you can select "Domain user" or "Domain group". To distinguish from local user and local group, the way to display domain user and domain group is different. The syntax for domain user and domain group is below.

<domain name>+<user account>
<domain name>+<group account>

Fig 5-7 below shows the domain user accounts. The same applies to domain group accounts as well. If a tree-like domain structure is created, multiple domain names will be displayed. For example, "KEVIN2012" is the parent domain, and "SUB" is the child domain.

©2015 Qsan Confidential. All rights reserved.

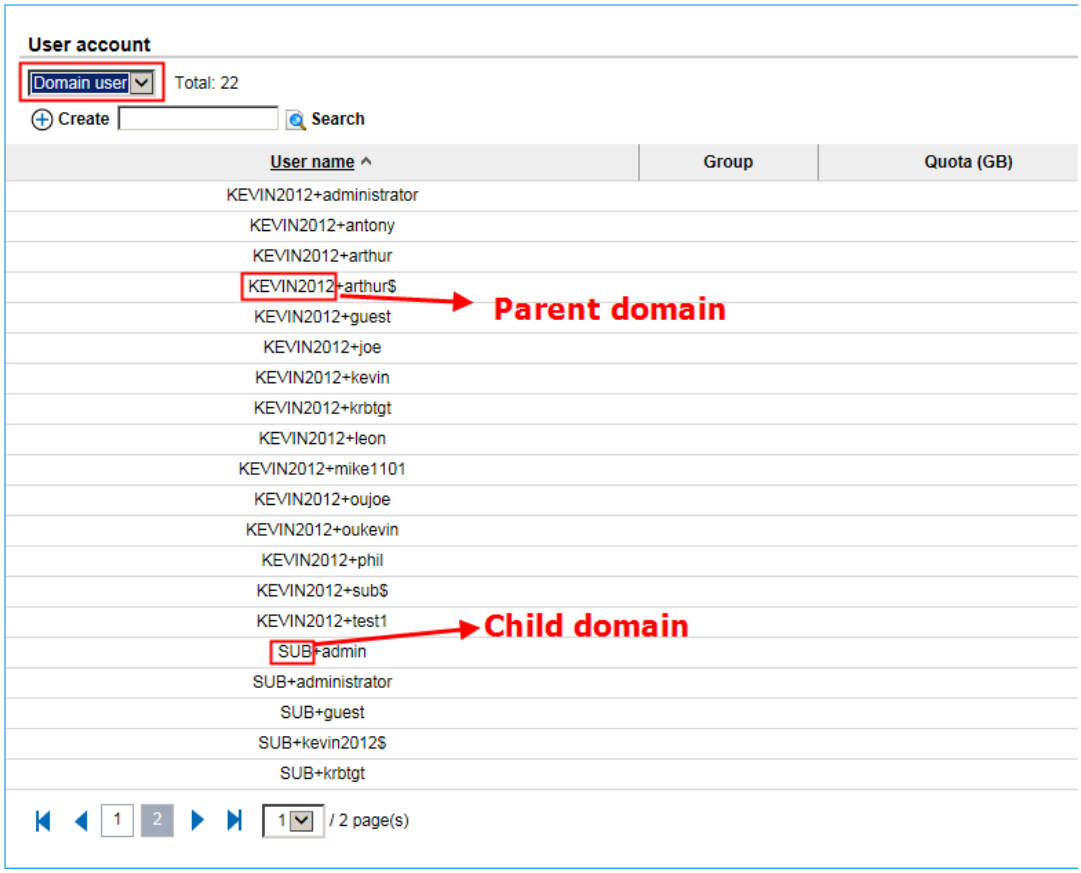


Fig 5-7 Domain users

To leave the domain is simple, just select “Standalone” and click “Ok”. The NAS system will leave the domain and clean all domain accounts.

LDAP management

LDAP stands for Light-weighted Directory Access Protocol. LDAP version 3 is supported. Similar to AD setting, select “LDAP” and Fig 5-8 dialog box will pop up. The meaning of each item in Fig 5-8 is described below.

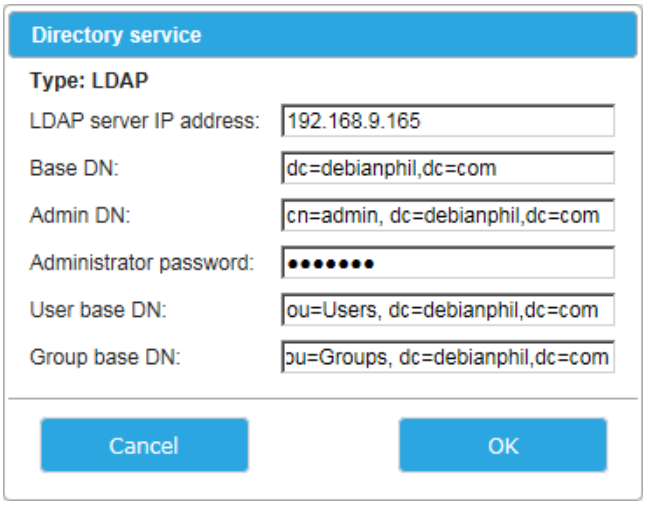


Fig 5-8 LDAP setup

©2015 Qsan Confidential. All rights reserved.

Item name	Description
LDAP server IP address	Enter server IP address.
Base DN	The base distinguished name (DN) indicates where in the LDAP directory you wish to load users and groups. It is the top level of the LDAP directory tree to be used when searching for resources. Suppose that all user accounts and groups are located in the “Users” folder under your domain. In LDAP form, it is cn=Users,dc=<your domain>. Let’s say your domain is aaa.bbb.com. The Base DN you should put in is cn=Users,dc=aaa,dc=bbb,dc=com.
Admin DN	By default, the administrator DN is in the form cn=Administrator,dc=<your domain>. Using previous example, The Admin DN should be put in is cn=Administrator,dc=aaa, dc=bbb,dc=com.
Administrator password	Enter the password of administrator of LDAP server.
User base DN Group base DN	DN stands for Distinguished Name. DN is the unique identifier of each entry in LDAP directory structure. This is used in the binding process when searching in LDAP directory structure.

Please make sure that LDAP server is up and running before joining LDAP domain. If there is no domain user listed on user account page after logging in, it means that the login process is not successful. You need to verify if the LDAP server is available or any of the login parameters is incorrect.
The login process will take a few minutes if there are over thousands of accounts. Please be patient.

Go to user account page and select domain user. Different content will be displayed. Fig 5-9 below shows the LDAP domain users.

©2015 Qsan Confidential. All rights reserved.

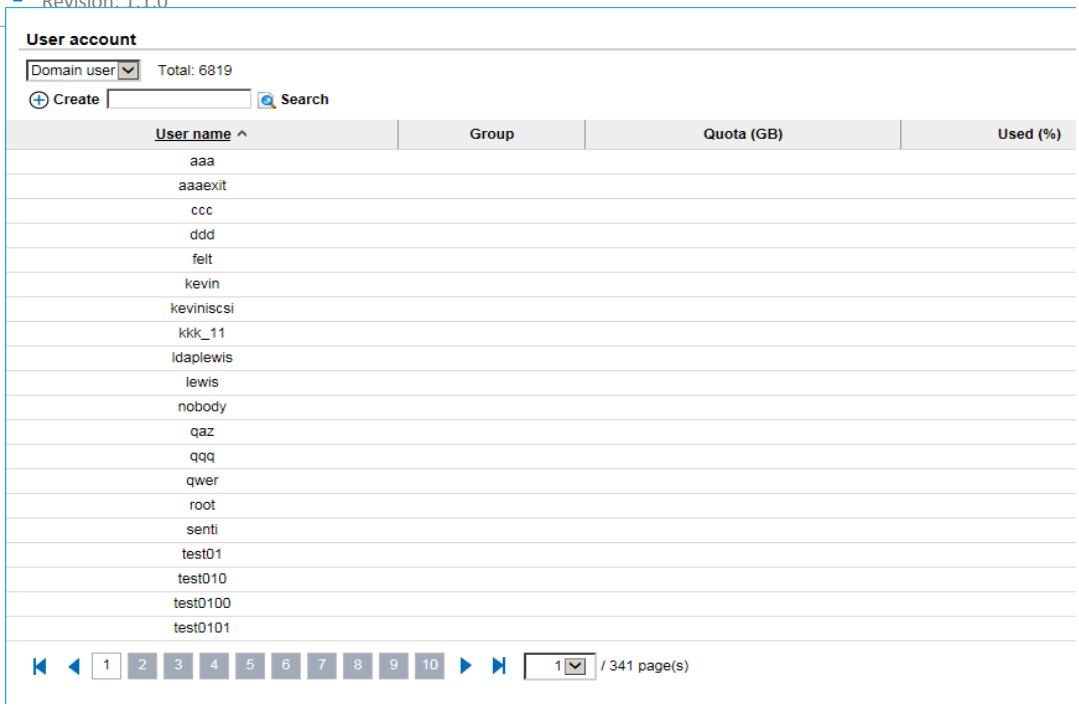


Fig 5-9 LDAP user accounts

Please be aware that the domain name will not be displayed in Fig 5-9. This is different from Active Directory service. And LDAP accounts can not be used in iSCSI CHAP authentication. It's because LDAP protocol doesn't support CHAP password encryption. One thing to note is that after joining LDAP domain, the local accounts will become unavailable for file sharing authentication. A simple table below summarizes the differences.

	Local accounts	LDAP domain accounts
File sharing access	No	Yes
iSCSI CHAP	Yes	No

TIP:
Please contact your LDAP server administrator for the correct login parameters for Base DN, Admin DN, User base DN, and Group base DN.

Import / Export account

If there are several TrioNAS, TrioNAS LX, TrioNAS LX HA systems in the company, and all of them need to share the same local user accounts and group accounts. Creating each account one by one and machine by machine is really time-consuming. Using import / export function can facilitate this process.

Go to "Privilege setting -> Accounts -> Import / Export". Use "Export" function to save local user and group accounts in an ASCII text file. Each row represents an

©2015 Qsan Confidential. All rights reserved.

account. The password is encrypted. Each account attribute is separated by a delimiter (a colon :). If there is no attribute value, it will be left as empty. The syntax goes like this.
<account name>:<encrypted password>:<quota>:<UID>:<email>:<description>

You may also create the text file following this format as an import file. If for some reason the syntax is incorrect or rules are not followed (such as forbidden characters are used), the importing process will stop at the problematic account and will not proceed further.

Group account follows the same logic as user account described above.

Account specification

This section summarizes the maximum number specifications that relate to user and group accounts for TrioNAS LX HA.

Both U400HA and U600HA have the following specifications.

Maximum local users	10000
Maximum local groups	1024
Maximum domain users	65535
Maximum domain groups	65535

Domain means either Active Directory or LDAP.

©2015 Qsan Confidential. All rights reserved.

Data protection – snapshot, replication, backup 6

In addition to the powerful RAID function and data consistency provided by ZFS in QSM operating system, this chapter introduces snapshot, remote replication, local clone, and cloud backup for more data protection measurements. Topics included are :

- Snapshot management
- Replication management
- Cloud backup
- Antivirus

Snapshot management

TrioNAS LX HA packs with powerful snapshot function. Snapshot employs copy-on-write technology to make differential backup to volumes and LUNs at block-level. It captures the instant state of the data at a point in time like a snapshot literally. It's a very efficient and effective way to make differential copies within the NAS system.

The beauty is that it supports both **volume snapshot** and **LUN snapshot**, which are the targets you take snapshots at. For example, you accidentally delete (Shift+Delete) a file in a share or modify a file in a wrong way. You can retrieve the file through snapshot effortlessly.

Go to "Storage management -> Snapshots -> Snapshot management". The table in Fig 6-1 below will display snapshots based on the filter selection. The drop-down list of the filter will contain all Volumes and LUNs for the user to choose from. The meaning of each item in Fig 6-1 is described below.

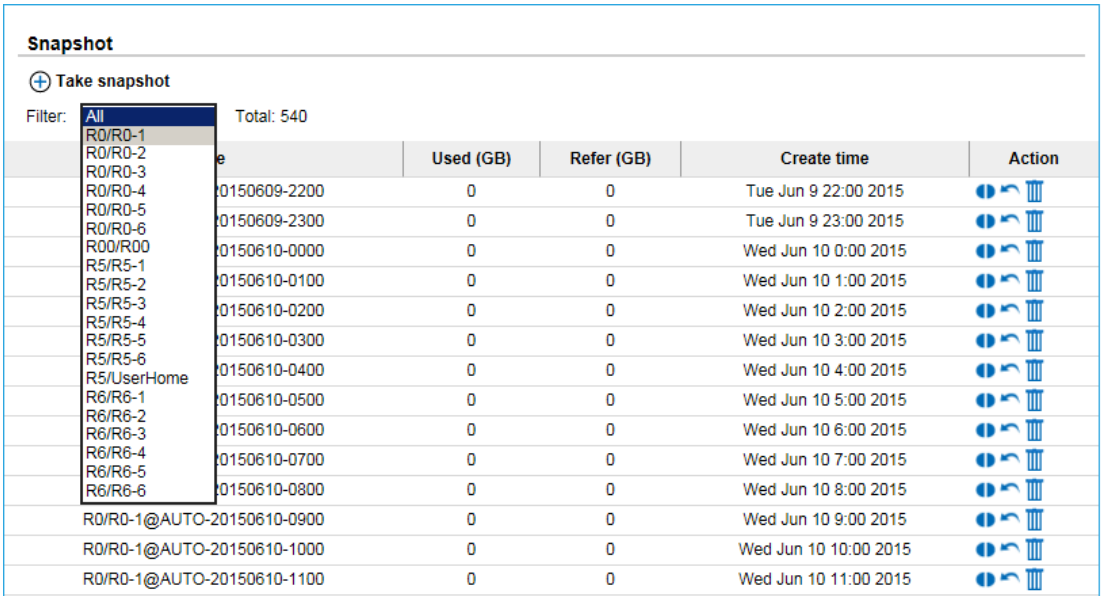


Fig 6-1 Snapshot table

©2015 Qsan Confidential. All rights reserved.

Item name	Description
Take snapshot	Click this button to start taking a new snapshot.
Filter	Select dedicated volume or LUN to display its snapshots.
Total	The overall snapshot count that the NAS system has. TrioNAS LX HA supports up to 4096 snapshots per system. There is no limit per volume or per LUN. When the system reaches 4096 snapshots, the oldest snapshot will be deleted as the latest one is taken.
Name	The snapshot name. It has the following syntax. **A/B@snapshot name-date time** A : Pool name B : Volume name or LUN name Snapshot name : It's the name you enter when creating a snapshot. AUTO means it's a scheduled snapshot. Date time : The date and time the snapshot was taken.
Used(GB)	The amount of snapshot space that has been used.
Refer(GB)	The refer capacity of the volume or LUN.
Create time	The time the snapshot is created.
Action	Available functions to the snapshot. Clone snapshot. Use this function to make a duplicated volume or LUN at that point in time. The physical space will be allocated from the storage pool. Rollback snapshot. Use the snapshot to roll back the content of volume or LUN to that point in time when the snapshot was taken. Please be aware that when you roll back a snapshot at T_n , all snapshots (T_{n+1} T_{n+2} T_{n+3} …. T_{latest}) after T_n will be deleted because data reference point is different and it makes snapshots (T_{n+1} T_{n+2} T_{n+3} …. T_{latest}) obsolete. Delete the snapshot.

To clone a snapshot, there will be a new volume or LUN listed in the volume page or LUN page. For example, let's clone a snapshot R5/R5-1@AUTO-20150609-2300 and Fig 6-2 below will pop up. Put in a name for the cloned volume or LUN and click "Apply".

TIP:
Snapshot uses copy-on-write technology to record differential data at block level between two points in time. The size of snapshot will take up storage pool space (the same storage pool of the volume or LUN that the snapshot is taken upon) to store the differential data.

©2015 Qsan Confidential. All rights reserved.

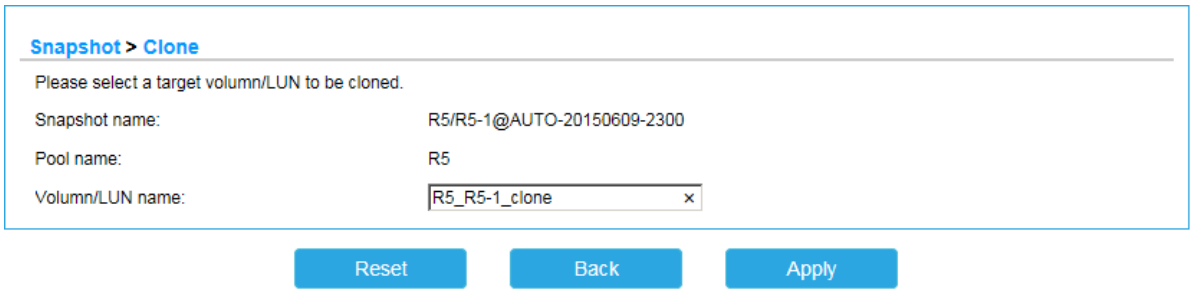


Fig 6-2 Clone a snapshot

Because R5-1 is a volume in storage pool – R5. Go to "Storage management -> Volumes" to check out volume table as Fig 6-2 below. A new volume R5_R5-1_clone is created and the "Original" attribute shows this volume comes from a snapshot (R5/R5-1@AUTO-20150609-2300). Now you can make a network share out of R5-1 and retrieve any file or folder you want.

Volumes

Create Delete

Name	Pool	Quota (GB)	Reserved (GB)	Used (GB)	Block size	Compression	Sync.	Copy #	Snapshot #	Schedule	Original	Action
R0-1	R0	2000	2000	0	64K	Enabled	Standard	3	4	Scheduled	-	
R0-2	R0	2000	2000	0.28	64K	Generic zero reclaim	Standard	3	27	Scheduled	-	
R1-1	R1	150	150	0.69	64K	Enabled	Standard	3	57	Scheduled	-	
R1-2	R1	150	150	1.52	64K	Generic zero reclaim	Standard	3	57	Scheduled	-	
R5-1	R5	2400	2400	0.86	64K	Enabled	Standard	3	61	Scheduled	-	
R5-2	R5	2400	2400	1.52	64K	Generic zero reclaim	Standard	3	61	Scheduled	-	
R5_R5-1_clone	R5	2400	2400	0	64K	Enabled	Standard	3	0	--	R5/R5-1@AUTO-20150609-2300	
UserHome	R5	None	None	1	64K	Zero reclaim	Standard	1	0	--	-	
R6-1	R6	1600	1600	0.84	64K	Enabled	Standard	3	61	Scheduled	-	
R6-2	R6	1600	1600	1.52	64K	Generic zero reclaim	Standard	3	61	Scheduled	-	

Fig 6-3 Cloned volume

Volume snapshot is like file snapshot and it's not limited to only an individual file but the whole share. All the files and folders inside the volume are protected by volume snapshot.

To clone a LUN snapshot simply repeats the same process as described above. You will see a new LUN created in LUN table.

TIP:
When the number of snapshots taken reaches over 1024 or more, booting time will become longer.

©2015 Qsan Confidential. All rights reserved.

Scheduled snapshot

TrioNAS LX HA supports snapshot automation. You may create a snapshot task that will take a snapshot periodically according to specified time duration. Go to "Storage management -> Snapshots -> Snapshot schedule". Click ⊕ Create to start a new task. The meaning of each item in Fig 6-4 is described below.

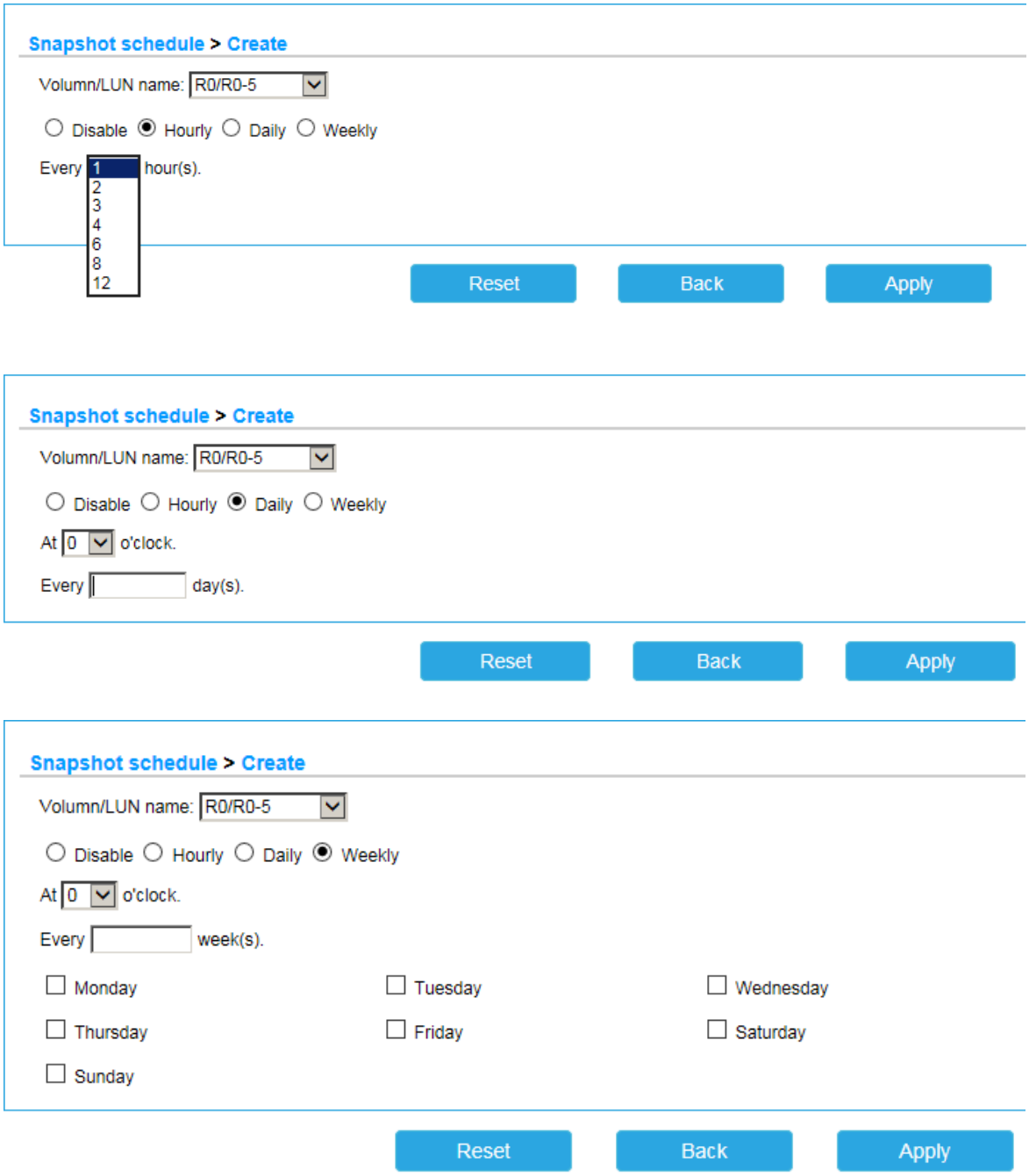


Fig 6-4 Create a snapshot task

Select the volume or LUN that you want to take a snapshot from the drop-down list. The syntax is A/B, where A stands for pool name and B stands for volume name or LUN name.
There three types of periodic schedule to choose from – hourly, daily, and weekly.

©2015 Qsan Confidential. All rights reserved.

Item name	Description
Hourly	Take a snapshot every few hours. Drop-down list supports 1, 2, 3, 4, 6, 8, and 12. The snapshot will be taken every 1 hour or every 2 hours or every 3 hours …etc.
Daily	Take a snapshot at specific hour every few days. Drop-down list supports 0~23. Enter a number for the duration of days.
Weekly	Take a snapshot at specific hour on certain week day(s) every few weeks. Drop-down list supports 0~23. Enter a number for the duration of weeks. Use checkbox to select the week day you want. Multiple selections are allowed.

Click “Apply” to commit the changes.

Fig 6-5 below shows the snapshot task table. The meaning of each item in Fig 6-5 is described below.

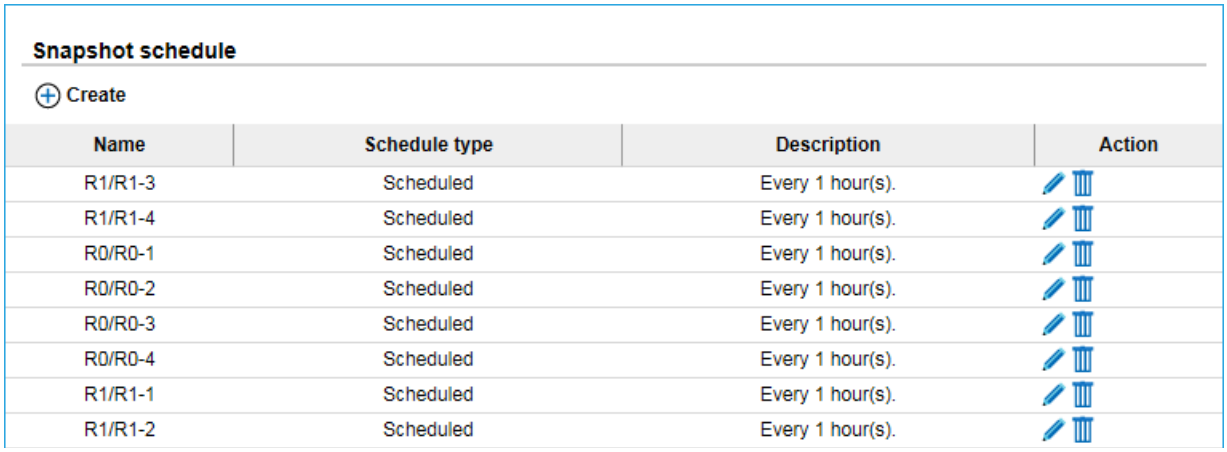


Fig 6-5 Snapshot task table

Item name	Description
Name	The name of the volume or LUN that snapshot is taken upon. Syntax is A/B, where A stands for pool name and B stands for volume name or LUN name.
Schedule type	Disabled : The task is stopped. Scheduled : The task is running normally.
Description	A brief description of periodic duration.
Action	Available functions to the snapshot. Edit the task. You may change the periodic duration setting. Delete the task.

©2015 Qsan Confidential. All rights reserved.

Snapshot is really a very useful and efficient tool to lay a minimum safety net to protect your data. Taking snapshots will NOT cause system performance to drop or take up too many resources. It's a brilliant way to protect the data.

TIP:
If there is not enough space in the storage pool, the system will stop taking snapshot and issue warning event logs.

Replication management

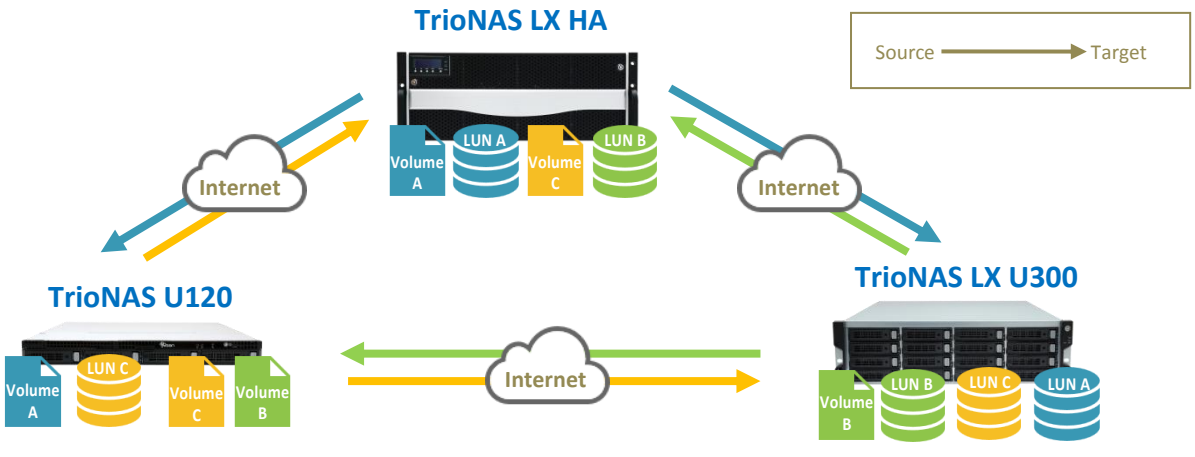
The most common way to data protection is to create duplication of data. Making local duplicated data is local cloning. Making duplicated data at remote site is remote replication. TrioNAS LX HA supports both.

Replication is asynchronous and employs snapshot function to perform efficient differential backup at block level. Remote replication will take up network bandwidth to send differential data. If you experience slow system performance, please reduce the remote replication tasks.

One-to-one replication task is supported instead of one-to-many. This means that the same replication source can not coexist in different replication tasks. The maximum remote replication tasks are 16, which includes both local clone tasks and remote replication tasks.

Remote replication connection is created through SSH protocol to guarantee the security of data transmission. All TrioNAS series and TrioNAS LX series can use remote replication between each other.

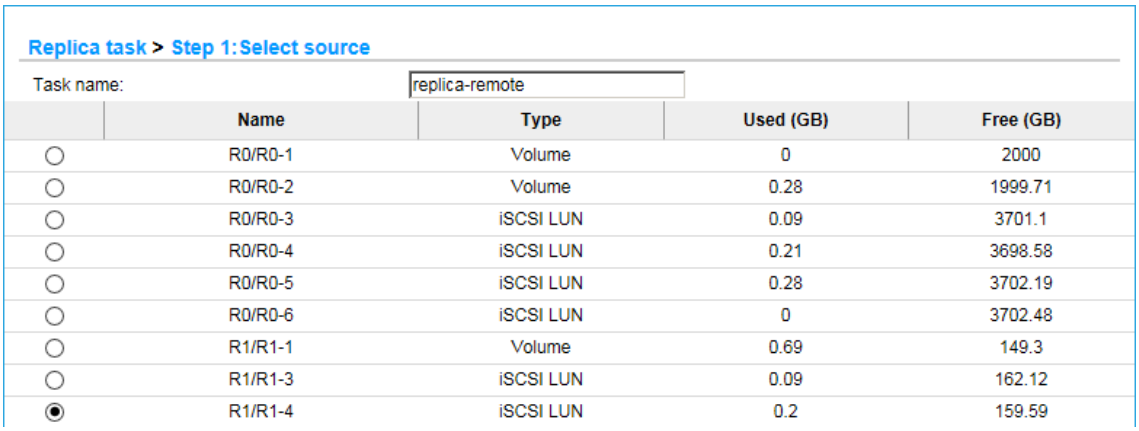
The mechanism behind the scene is that the task is always initialized by the master controller. The actual replication process of sending/receiving data is carried out by the owner controller of the volume or LUN. This will guarantee the efficiency and avoid unnecessary command shipping and I/O shipping across backplane. Should controller failover happens, the master controller and the owner controller become the same. So there is no problem there.



©2015 Qsan Confidential. All rights reserved.

Remote replication

Go to “Applications -> Backup -> Replications” and click “Create” to start a new task. Enter the name of the task and select the volume or LUN you want to duplicate.



Click “Next” to go to Step 2. This is where to differentiate from local clone to remote replication. Select “Remote system” and put in the related information of the remote NAS system. The meaning of each item in Fig 6-6 is described below.

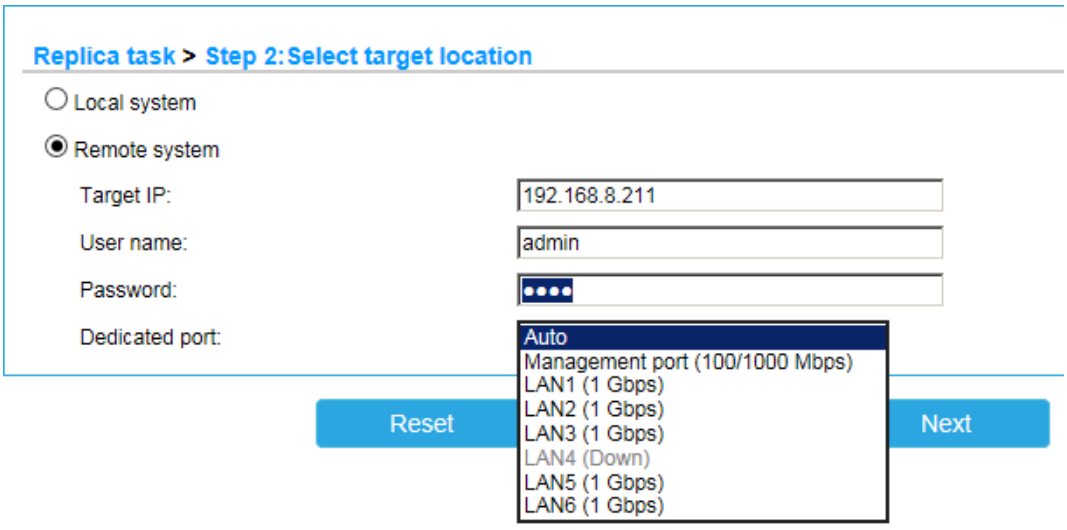


Fig 6-6 Step 2 of replication task

Item name	Description
Target IP	IP address of the network port of the remote NAS system. All network ports can be used for remote replication. Management port can be used for remote replication as well.
User name	Enter admin.
Password	Enter admin password.
Dedicated port	Select a network port that will be used for this replication task. If controller failover happens, the equivalent network port on the other controller will resume the replication task seamlessly.

©2015 Qsan Confidential. All rights reserved.

	Auto means that the NAS system will decide which network port to use according to the routing table. Drop-down list will display all available network ports. Link aggregation will not be displayed here.

Click “Next” to proceed to Step 3 as in Fig 6-7 below. Use the drop-down list of “Target pool” to select which storage pool to use to store replication data. Enter the name for the replicated volume or LUN.

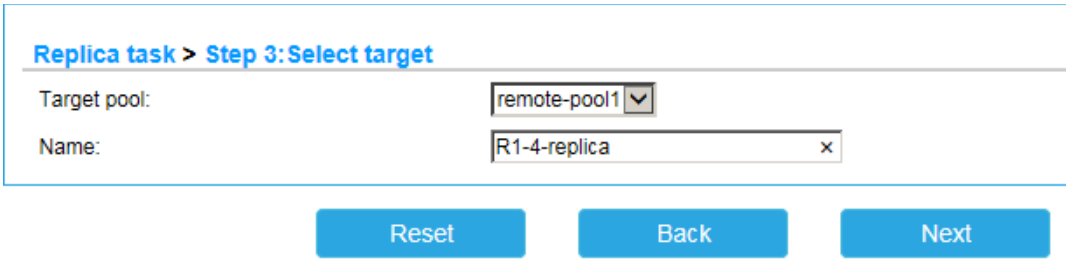
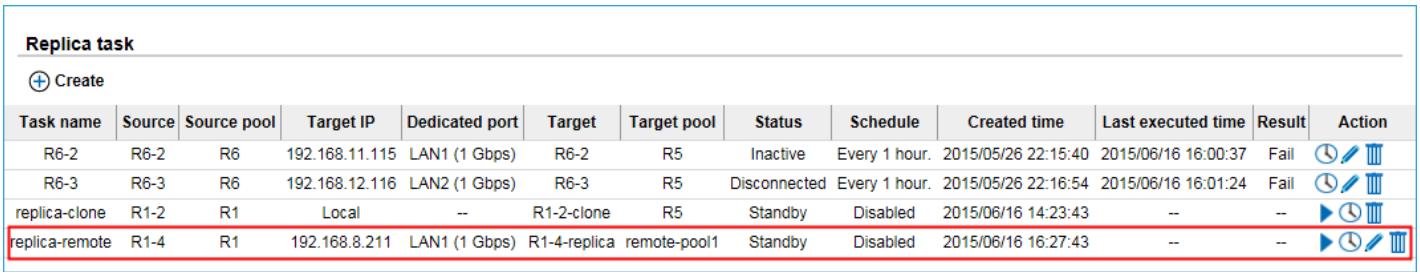


Fig 6-7 Step 3 : Select storage pool on remote system

Click “Next” to go to Step 4 to confirm the settings. Click “Apply” to complete the task. When the task is just created, there is no schedule setting. The periodic duration is set as disabled.
The new task will be shown in the replication table as in Fig 6-8 below. The meaning of each item in Fig 6-8 is described below.



Task name	Source	Source pool	Target IP	Dedicated port	Target	Target pool	Status	Schedule	Created time	Last executed time	Result	Action
R6-2	R6-2	R6	192.168.11.115	LAN1 (1 Gbps)	R6-2	R5	Inactive	Every 1 hour.	2015/05/26 22:15:40	2015/06/16 16:00:37	Fail	
R6-3	R6-3	R6	192.168.12.116	LAN2 (1 Gbps)	R6-3	R5	Disconnected	Every 1 hour.	2015/05/26 22:16:54	2015/06/16 16:01:24	Fail	
replica-clone	R1-2	R1	Local	--	R1-2-clone	R5	Standby	Disabled	2015/06/16 14:23:43	--	--	
replica-remote	R1-4	R1	192.168.8.211	LAN1 (1 Gbps)	R1-4-replica	remote-pool1	Standby	Disabled	2015/06/16 16:27:43	--	--	

Fig 6-8 Replication task table

Item name	Description
Task name	The name entered in Step 1.
Source	The source volume or LUN to be replicated.
Source pool	The storage pool where the source volume or LUN belongs to.
Target IP	IP address on the remote system. **Local** : the task is for local clone.
Dedicated port	The network port used by the replication task. If the task is for local clone, it’s blank here.
Target	The name of the replicated volume or LUN.
Target pool	The storage pool where the replicated volume or LUN belongs to.
Status	There are four statuses. **Standby** : The task is ready to run. The schedule has not arrived

©2015 Qsan Confidential. All rights reserved.

	yet. For every few seconds, the system will check the status of source pool, target IP, and target pool to make sure the task is healthy. **Running** : The task is running. **Inactive** : When source pool or target pool can't be accessed or when it's uncertain if the task will fail, the status becomes inactive. **Disconnected** : When target IP can't be accessed, the status becomes disconnected.
Schedule	The periodic duration setting. **Disabled** : there is no periodic duration setting.
Created time	The time the task is created.
Last executed time	The last time the task was executed.
Result	**Success** : The task completes successfully. **Fail** : The task failed. **Terminated** : The task was aborted by ■ stop function.
Action	Available functions to the replication task. ▶ Start the task. When there is no schedule setting, this function is enabled. ■ Stop the task. When there is no schedule setting, this function is enabled. Set periodic duration just like the snapshot. Edit the replication task from Step 2. Delete the task.

Some rules to note :

- Attributes (snapshots, thin provisioning, deduplication, compression, number of copies) of the source volume or LUN will be replicated as well.
- If the source volume or LUN is deleted, the associated replication task(s) will be deleted automatically and a warning event log will be issued.
- When replication task is running and the network connection is broken (cable plug-out, network switch failure, target IP change), the task will fail and return to Standby status.
- When replication task is running and the owner controller fails or is plugged out, the task will fail and abort. The other controller will take over the task as the next trigger point arrives.
- If you remove the hard drives of the source volume or LUN after shutdown, the next time you power on the machine and the replication task will become Inactive.
- There is no access limit to the replicated volume or LUN on the target system. If the replicated volume or LUN is used by other purposes, the data will be INCONSISTENT. We strongly suggest not doing this.

After the task is carried out successfully, you will see the replicated volume or LUN on the target NAS system. The replication task takes longer time to complete for the very first time because it's a full copy. The subsequent replication will be faster because it's differential copy by copying the snapshot only. The benefits are

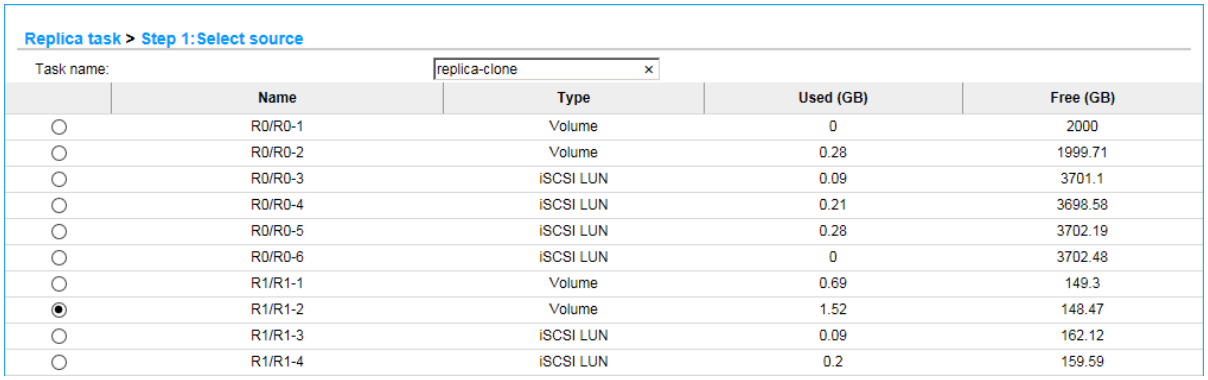
©2015 Qsan Confidential. All rights reserved.

if the replication task fails, the previous version is still intact and you inherit all the advantages of snapshot.

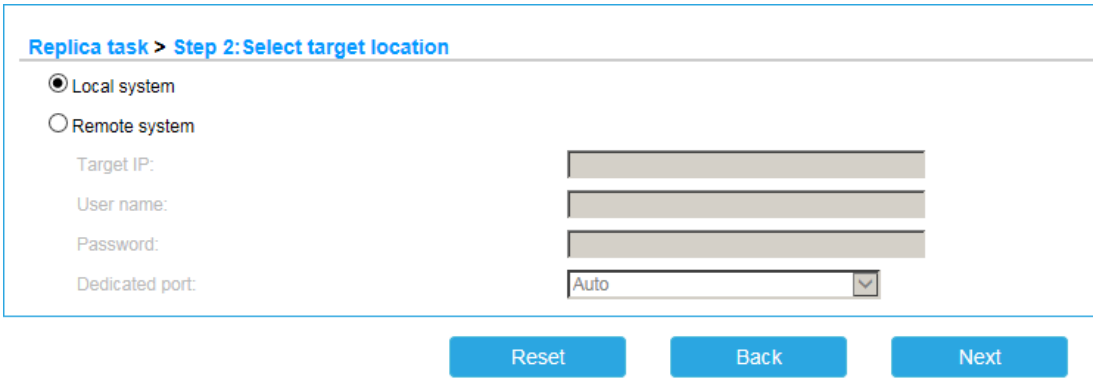
	CAUTION	Please reserve the replicated volume and LUN on the target system for replication purpose only. Do not modify the content of the replicated volume or LUN if there are more replications to come in the future. Otherwise, it will cause data inconsistency in the replicated volume and LUN.

Local clone

Data redundancy will be created without generating network traffics. Go to "Applications -> Backup -> Replications" and click "Create" to start a new task. Enter the name of the task and select the volume or LUN you want to duplicate.

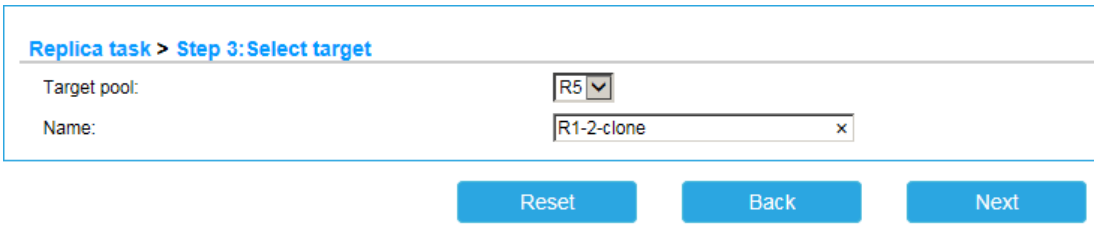


Click "Next" to go to Step 2. This is where to differentiate from local clone to remote replication. Select "Local system" and the remote system part will be grey out.

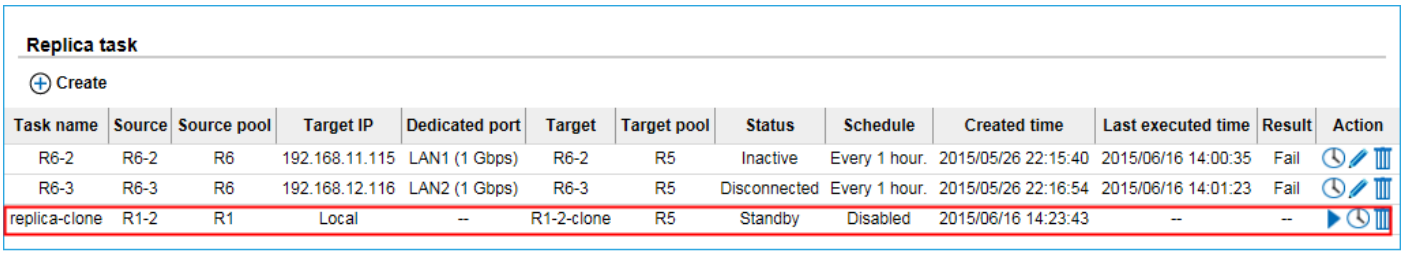


Click "Next" to go to Step 3. Select the storage pool to duplicate the volume or LUN. Enter the name of the volume or LUN.

©2015 Qsan Confidential. All rights reserved.



Click “Next” to go to Step 4 to confirm the settings. Click “Apply” to complete the task. The new task will be shown in the replication table as in Fig 6-9 below. Please refer to the previous section of the item explanation of the table.



Task name	Source	Source pool	Target IP	Dedicated port	Target	Target pool	Status	Schedule	Created time	Last executed time	Result	Action
R6-2	R6-2	R6	192.168.11.115	LAN1 (1 Gbps)	R6-2	R5	Inactive	Every 1 hour.	2015/05/26 22:15:40	2015/06/16 14:00:35	Fail	
R6-3	R6-3	R6	192.168.12.116	LAN2 (1 Gbps)	R6-3	R5	Disconnected	Every 1 hour.	2015/05/26 22:16:54	2015/06/16 14:01:23	Fail	
replica-clone	R1-2	R1	Local	--	R1-2-clone	R5	Standby	Disabled	2015/06/16 14:23:43	--	--	

Fig 6-9 Local clone in replication task table

Click to set the schedule, which is the same logic as snapshot schedule. Local clone follows the same rules as remote replication in the last section.

Cloud backup – Amazon S3

TrioNAS LX HA integrates API provided by Amazon S3 service to allow data transmission to and from the Cloud storage. Before using this function, you must register an Amazon S3 account first at http://aws.amazon.com/s3/
There is no limit to the number of how many Amazon S3 tasks can be created. If you experience slow system performance, please reduce the Amazon S3 tasks.

Go to “Applications -> Backup -> Cloud” and click Create to create a new task. The meaning of each item in Fig 6-10 is described below.

Item name	Description
Task name	Enter a name for the backup task.
Local path	Select the volume from the drop-down list. Enter the folder name you want to backup.
Backup type	Upload : upload files to Amazon S3 Download : download files to TioNAS LX HA
Access key	Access key provided by Amazon S3
Private key	Private key provided by Amazon S3
Bucket/folder	Bucket : bucket name on Amazon S3 Cloud Folder : folder name in the bucket
Delete extra files in destination folder	Check this to synchronize both the source and destination folders.

©2015 Qsan Confidential. All rights reserved.

Test connection	Verify if the connection with Amazon S3 can be established.

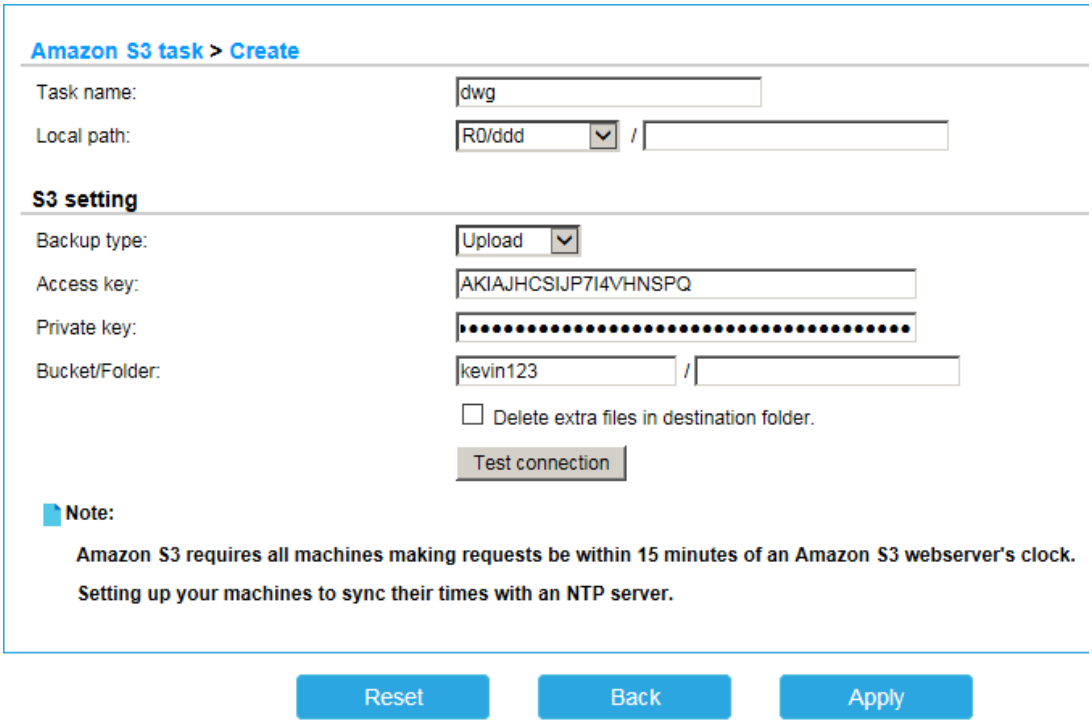


Fig 6-10 Create an Amazon S3 task

Click “Apply” to create a new task. The task table looks like Fig 6-11 below. The meaning of each item in Fig 6-11 is described below.

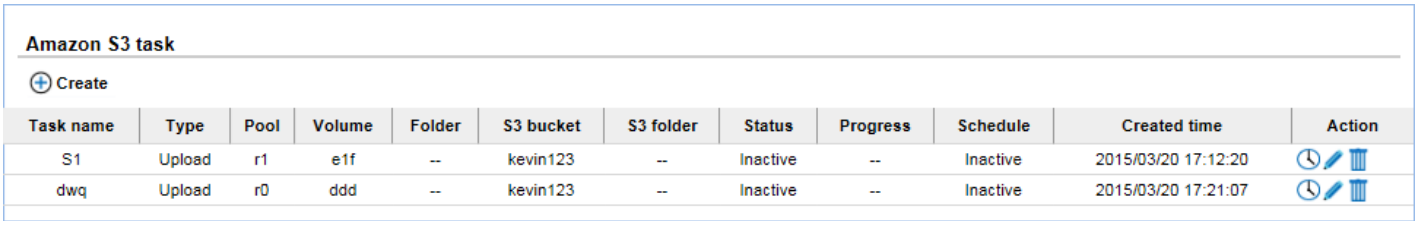

Amazon S3 task
Create
Task name Type Pool Volume Folder S3 bucket S3 folder Status Progress Schedule Created time Action
S1 Upload r1 e1f -- kevin123 -- Inactive -- Inactive 2015/03/20 17:12:20
dwq Upload r0 ddd -- kevin123 -- Inactive -- Inactive 2015/03/20 17:21:07

Fig 6-11 Amazon S3 task table

Item name	Description
Status	The same definition as replication **Standby**, **Running**, **Inactive**, **Disconnected**
Progress	
Schedule	The periodic duration setting. **Disabled** : there is no periodic duration setting.
Action	Available functions to the replication task. ▶ Start the task. When there is no schedule setting, this function is enabled. ■ Stop the task. When there is no schedule setting, this function is enabled.

©2015 Qsan Confidential. All rights reserved.

	Set periodic duration just like the snapshot. Edit the replication task from Step 2. Delete the task.

Antivirus function

TrioNAS LX HA supports ICAP (Internet Content Adaption Protocol) protocol to perform virus scanning function. ICAP is a lightweight protocol developed to allow scanning and modification of web content passing through a web proxy. Being designed as a lightweight protocol for high performance and security checks, ICAP is well-suited for use with NAS appliance and file sharing services.

When antivirus service is enabled, it will real-time monitor all incoming files (write) for continuous protection. Incoming files will be sent to ICAP server (virus server such as Symantec Scan Engine or ClamAV) for scanning. If a virus is detected, the action taken to process the infected file is determined by virus server, not by TrioNAS LX HA.

The default port number is 1344. Virus scanning will not take up NAS system resources, but it will impact network performance because all files need to be sent to ICAP server over the network.

Go to “Security -> Antivirus -> Antivirus service” to enable or disable ICAP service. Enter the IP address and port number of ICAP server. “Max connection” means how many sessions will be created for sending files. Click “Apply” to establish the connection. Fig 6-11 below shows the login page.

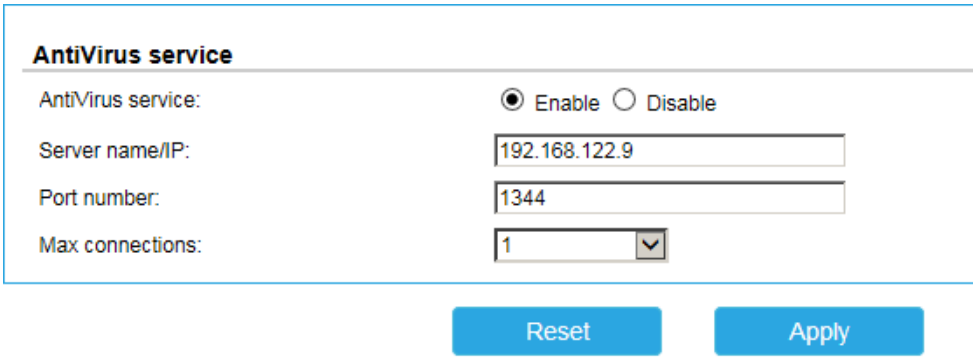


Fig 6-11 Enable ICAP service

Flexibility is provided to allow more options for virus scanning. You may use these filtering options to trim down the network workload. Use “Exclude file type” to skip certain files. For example, text file (*.txt) usually will not get infected by virus. Use “Exclude share” to remove some shares from the scanning list.

©2015 Qsan Confidential. All rights reserved.

When infection is found, the infected file will get treated according to the setting in ICAP server. A record is created to document this. Fig 6-12 below shows the table. You may download all the records as a scanning report for other usage.

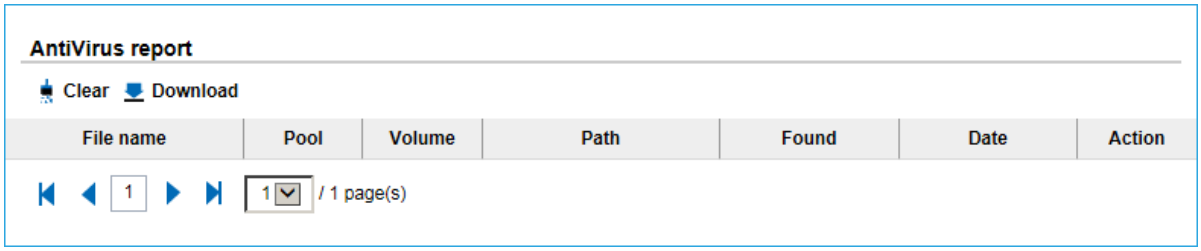


Fig 6-12 Antivirus report table

©2015 Qsan Confidential. All rights reserved.

7 System maintenance and monitoring

This chapter will explains how to manage enclosure-related functions, get the big picture of how the NAS system is running in general, and monitor the readings of different sensors. The topics included are :

- Dashboard
- System information
- Firmware upgrade and synchronization
- Import/export
- Reset to factory default
- Reboot/shutdown

Dashboard

This is the landing page after logging in TrioNAS LX HA. It gives you a big picture of how the NAS system is performing and the general health status of the system. So you don't need to go to each individual page separately. There are 13 sections of information boards. They can be customized by selecting only the sections you are interested in. You can do this through the drop-down list Display list on the upper left corner. Or you may fold each section by clicking on the upper right corner of each section. The page content will be updated automatically. The refresh rate can be set using the drop-down list 5 seconds on the upper right corner.

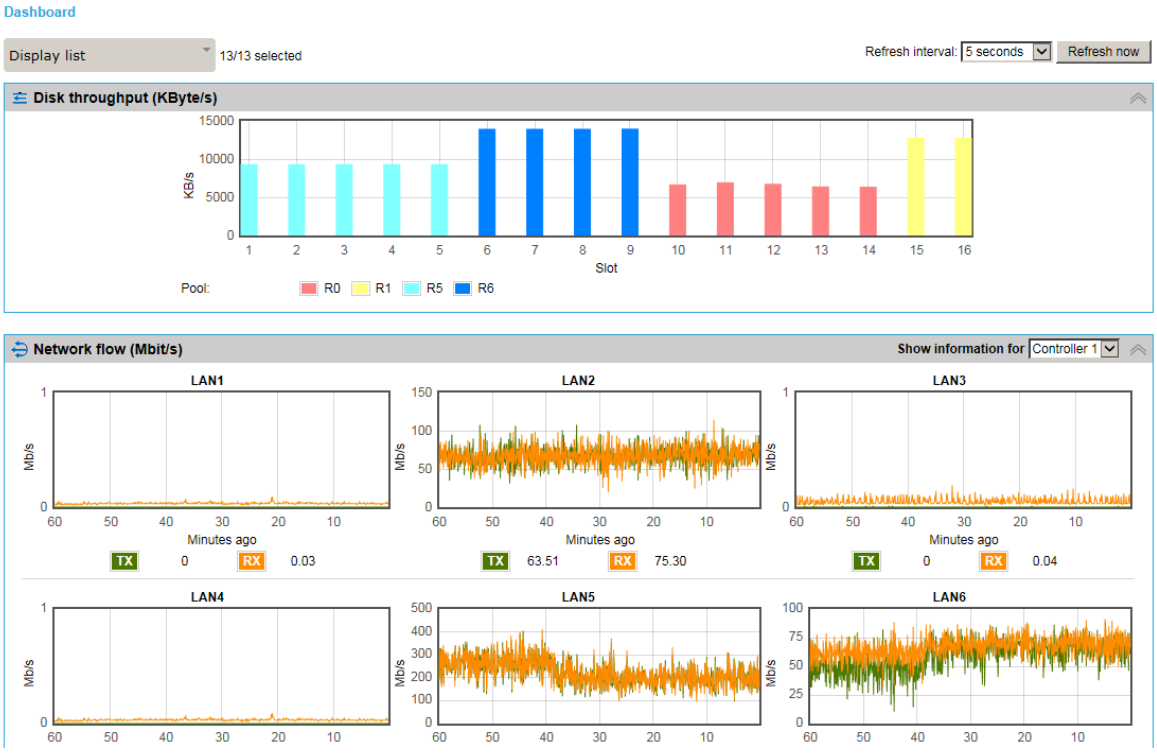


Fig 7-1 Dashboard

©2015 Qsan Confidential. All rights reserved.

Dashboard section	Description
Disk throughput	The unit is KByte/s. Disks belonging to the same RAID group will have the same color. It helps you see visually where the bottleneck is.
Network flow	The unit is Mbit/s. It's performance monitor function. Use the drop-down list on upper right corner to select the peer controller.
CPU usage	CPU workload.
Memory usage	How much memory is consumed.
System information	Same information of System setting -> Maintenance -> System information
Temperature	Same information of Monitor -> Hardware monitor -> Temperature
Power supply	Same information of Monitor -> Hardware monitor -> Power supply
Cooling	Same information of Monitor -> Hardware monitor -> Cooling
Pool status	Simplified table of Storage management -> Pools
Nic status	Simplified table of System setting -> Network -> General setting
Event log	Simplified table of System setting -> Network -> General setting
Service status	Summarized information of Privilege setting -> File services
UPS status	Same information of System setting -> Power management -> UPS

Online connections

You can check who connects to TrioNAS LX HA to get a general idea of its usage. The connections are categorized into two kinds : file service and iSCSI service.

Go to "Dashboard -> Online connections -> File service". All file sharing connections such as CIFS and NFS will be shown here. Remote replication connections will be shown here as SSH. The item in Fig 7-2 will be described below.

Online users

Login date	Login time	User	Client	Service
Thu, Jun 18, 2015	09:54:27	admin	robert-notebook(192.168.159.159)	CIFS
Wed, Jun 17, 2015	17:10:22	admin	192.168.169.12	SSH

Fig 7-2 Connections of file services

Item	Description
Login date	The date the connection is established.
Login time	The time the connection is established.
User	Who uses this connection.
Client	Client machine information (IP address).
Service	Network protocol used for the connection.

©2015 Qsan Confidential. All rights reserved.

	CIFS : Windows machines connect to the NAS system. **NFS** : Linux or Unix machines connect to the NAS system. **SSH** : Remote replication or console UI for debugging.

Go to “Dashboard -> Online connections -> iSCSI service”. All iSCSI connections will be shown here. The meaning of each item in Fig 7-3 is described below.

Online connections

No.	Initiator name	Initiator IP	Target name	InitialR2T	Immed. data	MaxOutR2T	MaxDataBurstLen
1	iqn.1991-05.com.microsoft:win-m26ig5f651u	192.168.11.55	iqn.2004-08.com.qsantechnology:u400ha-424-000901a00:dev11.ctr1	Yes	Yes	1	262144
2	iqn.1991-05.com.microsoft:win-m26ig5f651u	192.168.11.55	iqn.2004-08.com.qsantechnology:u400ha-424-000901a00:dev8.ctr1	Yes	Yes	1	262144
3	iqn.1991-05.com.microsoft:win-nls9v9beo1r	192.168.11.73	iqn.2004-08.com.qsantechnology:u400ha-424-000901a00:dev8.ctr1	Yes	Yes	1	262144
4	iqn.1991-05.com.microsoft:win-so1ajo8am1k	192.168.12.77	iqn.2004-08.com.qsantechnology:u400ha-424-000901a00:dev2.ctr1	Yes	Yes	1	262144
5	iqn.1991-05.com.microsoft:win-so1ajo8am1k	192.168.12.77	iqn.2004-08.com.qsantechnology:u400ha-424-000901a00:dev6.ctr1	Yes	Yes	1	262144
6	iqn.1991-05.com.microsoft:win-m26ig5f651u	192.168.11.55	iqn.2004-08.com.qsantechnology:u400ha-424-000901a00:dev10.ctr1	Yes	Yes	1	262144
7	iqn.1991-05.com.microsoft:win-m26ig5f651u	192.168.11.55	iqn.2004-08.com.qsantechnology:u400ha-424-000901a00:dev9.ctr1	Yes	Yes	1	262144
8	iqn.1991-05.com.microsoft:win-so1ajo8am1k	192.168.12.77	iqn.2004-08.com.qsantechnology:u400ha-424-000901a00:dev4.ctr1	Yes	Yes	1	262144
9	iqn.1991-05.com.microsoft:win-so1ajo8am1k	192.168.12.77	iqn.2004-08.com.qsantechnology:u400ha-424-000901a00:dev0.ctr1	Yes	Yes	1	262144
10	iqn.1991-05.com.microsoft:win-m26ig5f651u	192.168.12.57	iqn.2004-08.com.qsantechnology:u400ha-424-000901a00:dev8.ctr2	Yes	Yes	1	262144
11	iqn.1991-05.com.microsoft:win-m26ig5f651u	192.168.12.57	iqn.2004-08.com.qsantechnology:u400ha-424-000901a00:dev9.ctr2	Yes	Yes	1	262144
12	iqn.1991-05.com.microsoft:win-m26ig5f651u	192.168.12.57	iqn.2004-08.com.qsantechnology:u400ha-424-000901a00:dev10.ctr2	Yes	Yes	1	262144

Fig 7-3 Connections of iSCSI service

Item	Description
No	Ascending order
Initiator name	IQN name of the host computer that runs iSCSI initiator.
Initiator IP	IP address of iSCSI initiator
Target name	iSCSI target IQN name of TrioNAS LX HA
InitialR2T	InitialR2T (Initial Ready to Transfer) is used to turn off either the use of a unidirectional R2T command or the output part of a bidirectional command. The default value is Yes.
Immed. Data	Immed. data (Immediate Data) sets the support for immediate data between the initiator and the target. Both must be set to the same setting. The default value is Yes.
MaxOutR2T	MaxDataOutR2T (Maximum Data Outstanding Ready to Transfer) determines the maximum number of outstanding ready to transfer per task. The default value is 1.
MaxDataBurstLen	MaxDataBurstLen (Maximum Data Burst Length) determines the maximum SCSI data payload. The default value is 256kb.

Through this table, it gives you a big picture of iSCSI service usage on TrioNAS LX HA.

©2015 Qsan Confidential. All rights reserved.

System information

This page provides the critical hardware version and firmware version information when it comes to customer support service or trouble shooting issues. It contains more details than “System information” section in Dashboard mentioned above.

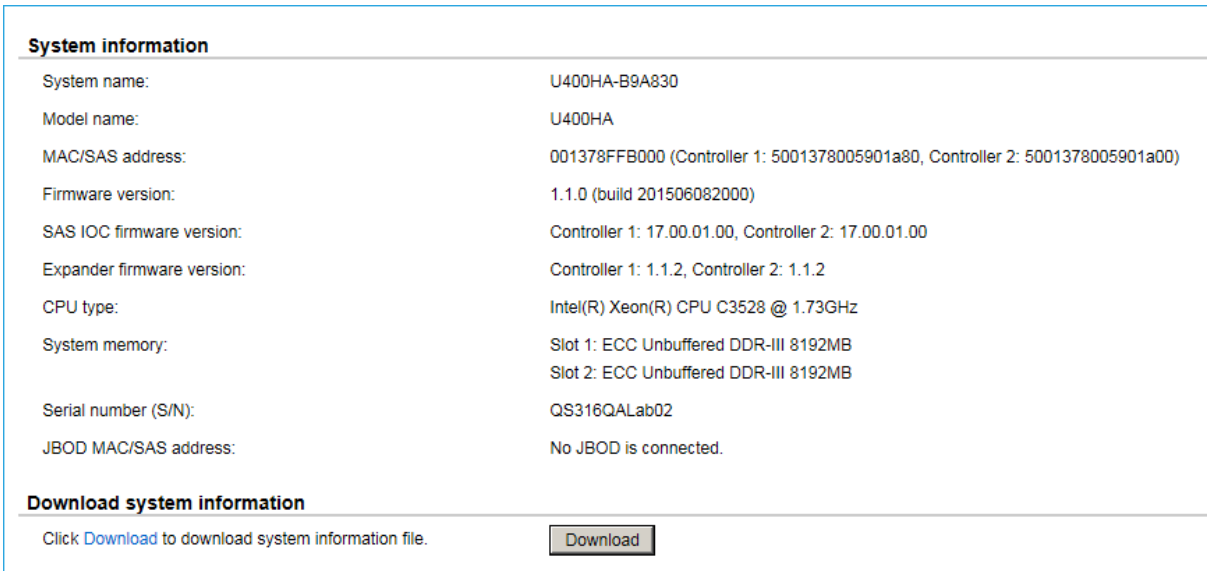

System information
System name: U400HA-B9A830
Model name: U400HA
MAC/SAS address: 001378FFB000 (Controller 1: 5001378005901a80, Controller 2: 5001378005901a00)
Firmware version: 1.1.0 (build 201506082000)
SAS IOC firmware version: Controller 1: 17.00.01.00, Controller 2: 17.00.01.00
Expander firmware version: Controller 1: 1.1.2, Controller 2: 1.1.2
CPU type: Intel(R) Xeon(R) CPU C3528 @ 1.73GHz
System memory: Slot 1: ECC Unbuffered DDR-III 8192MB
Slot 2: ECC Unbuffered DDR-III 8192MB
Serial number (S/N): QS316QALab02
JBOD MAC/SAS address: No JBOD is connected.
Download system information
Click Download to download system information file.
Download

Fig 7-4 System information

Should anything goes wrong and customer support service is needed, use the “Download” button to download complete system information, which contains event log, storage configuration, system configuration and other debug information. Please send the downloaded file to customer support for further evaluation and assessment.

Firmware upgrade and synchronization

This is where to perform the firmware upgrade operation. Click “Browse” button to locate the new firmware file (BIN file) and click “Upgrade” button to start. You will see Fig 7-5 the progress bar to indicate the percentage of completion.

During upgrade process, please make sure the power source remains ON all the time. Otherwise, the upgrade process will fail and result in boot failure the next time you power on the system.

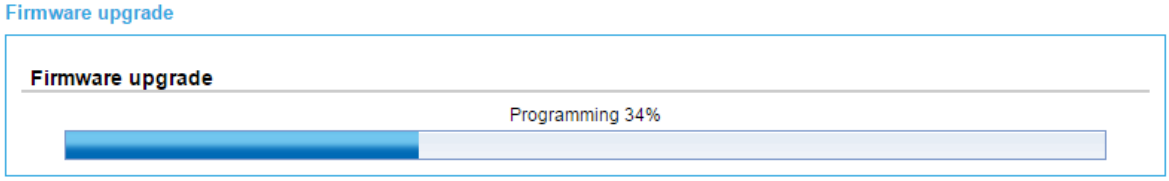


Fig 7-5 Progress bar

The upgrade process will refresh SATA DOM with the latest firmware content. When it’s done, Fig 7-4 below will pop up to indicate the completion.

©2015 Qsan Confidential. All rights reserved.

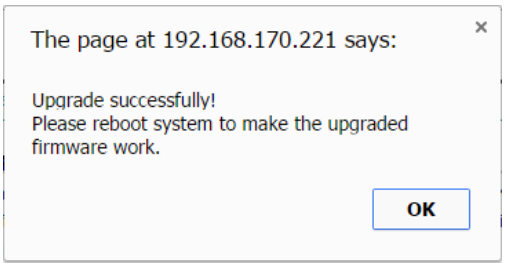


Fig 7-6 Firmware upgrade completion notice

The next step after Fig 7-6 is to execute reboot function to make the latest firmware take effect. To provide the upmost high availability, each RAID controller will reboot itself in turns. The data services will not stop during upgrade process. Because of this, the overall process may take up to 10 minutes.

When the firmware versions on both controllers are different, the slave controller will be locked down. The decision is based on the mastership even though the slave controller has newer firmware version.

If this locked-down situation happens and it is due to firmware version mismatch, click on “Synchronize” button. After firmware synchronization, the slave controller will reboot and the system will return to normal status.

Import / Export

Configuration file contains the setting information from

System setting -> High availability setting
System setting -> General setting -> System
System setting -> General setting -> Time
System setting -> Network (All)
Storage management -> iSCSI -> General setting
Privilege setting -> Accounts -> Directory service

You may use the Import function to restore the original system settings.

Reset to factory default

Basically, this function will reset all the values in system configuration file (previous section) to factory defaults. Please be aware that executing this function will come with an automatic reboot.

The following items will be performed :

- System settings (previous section) will be reset .
- Administrator password will be reset to 1234.
- Clear all access rights settings for shares.
- Clear all snapshot, replication, and backup tasks.
- Clear all user/group accounts by option.

©2015 Qsan Confidential. All rights reserved.

Please be aware that “Reset to factory defaults” will not delete the user data in UserHome file system. If you create a local user account with the same name, the system will see it as the same user and use the original user account folder.

Reboot and shutdown

During rebooting, the data services remain online. Both controllers take turn to reboot to maintain the maximum system uptime. Because of this, the overall reboot process will take 10-15 minutes.

Shutdown is to turn off the power to the system. After executing shutdown, the system will stop all running tasks and flush the memory cache data to the hard drives before turning off the power. When the power is off, please remember to turn the power switch on the back of the system to OFF status.

©2015 Qsan Confidential. All rights reserved.

8 Advanced operations

This chapter introduces how to use console commands for debugging and system maintenance. Topics covered include the following :

- Snapshot management
- Replication management
- Cloud backup

Serial console connection

On the controller bracket, there is a phone jack connector for serial console management as in Fig 8-1 below.

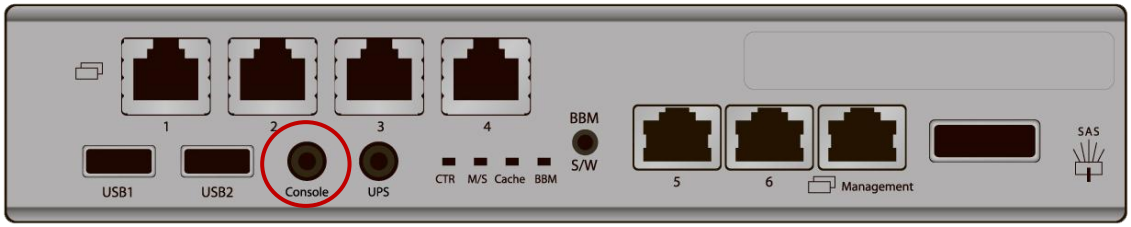


Fig 8-1 Console port on controller bracket

Use console cable (NULL modem cable) to connect from console port of the storage system to RS 232 port of the management PC. Use the the following settings for the serial console connection :
Baud rate: 115200, 8 data bit, no parity, 1 stop bit, and no flow control.
Terminal type: vt100

The initial defaults for administrator login are:
User name: admin
Password: 1234

Secure shell remote connection

SSH (secure shell) software is required for remote login. The SSH client software is available at the following web site:
SSH Tectia Client: http://www.ssh.com/
PuTTY: http://www.chiark.greenend.org.uk/

©2015 Qsan Confidential. All rights reserved.

The default management IP address is 192.168.1.234/255.255.255.0, please configure your computer IP address at the same subnet of the system (e.g.: 192.168.1.1/255.255.255.0). The remote control settings are on the following:
Host IP: <*IP Address*> (e.g.: 192.168.1.234)
Port: 2222
User Name: admin
Password: 1234

TIP:
Qsan system supports SSH for remote access only. When using SSH, the IP address and password are required for login.

Console UI

When login to the system, there is a prompt, type **help** and press **Enter** button. It will display help description as Fig 8-2 below.

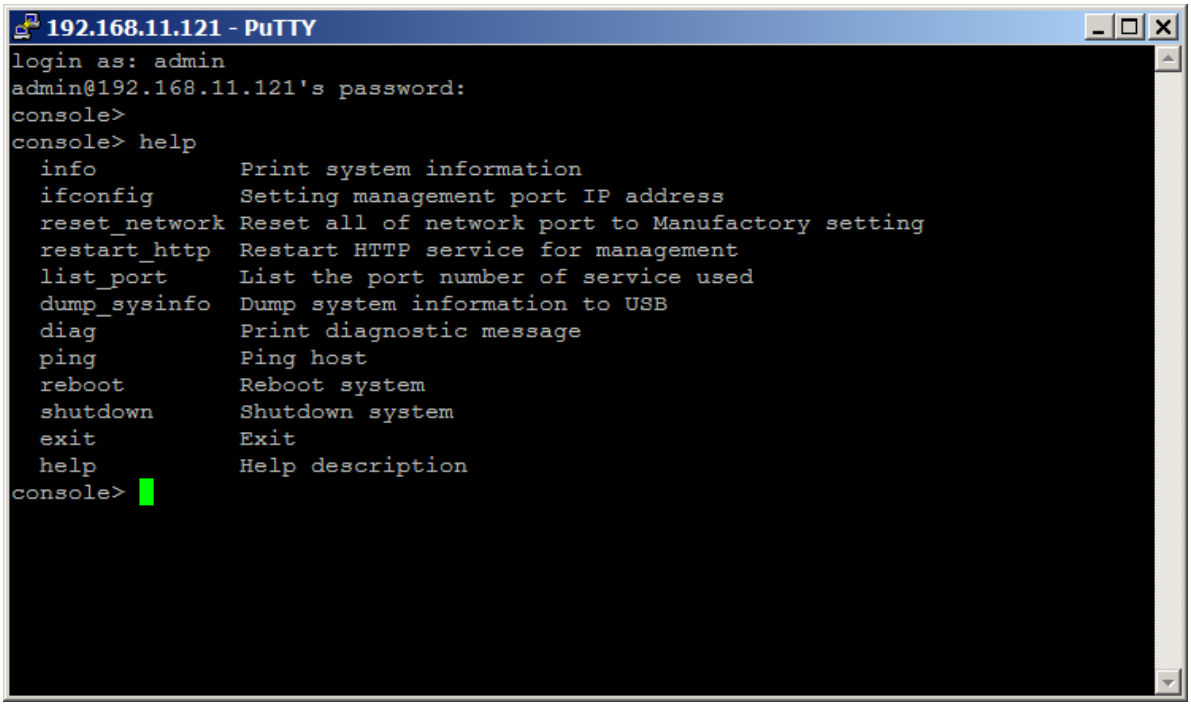


Fig 8-2 Console UI commands

Each command is explained below.

info**:** Print the system information.
console> info
[System]
Product: U400HA
Name: U400HA-xxxxxx
Version: 1.0.0
[Network]

©2015 Qsan Confidential. All rights reserved.

```
LAN0 => MAC 00:13:78:xx:xx:xx  Addr:192.168.x.x  Mask:255.255.0.0
LAN1 => MAC 00:13:78:xx:xx:xx  Addr:169.254.x.x  Mask:255.255.0.0
LAN2 => MAC 00:13:78:xx:xx:xx  Addr:169.254.x.x  Mask:255.255.0.0
LAN3 => MAC 00:13:78:xx:xx:xx  Addr:169.254.x.x  Mask:255.255.0.0
```

ifconfig**:** Setup the IP address of the management port.

```
console> ifconfig
 Setting eth0 IP address usage:
     ifconfig IP MASK [GATEWAY]
     ifconfig DHCP
```

reset_network**:** Reset all of network ports to factory default setting.

restart_http**:** If the web UI is abnormal, restart HTTP service for management.

list_port**:** List the port number of the services.

```
console> list_port
 [Service]    [Port]
  http        => 80
  https       => 443
  ssh         => 2222
  ftp         => 21
  sftp        => 22
  webdav      => 50000
  webdavs     => 8888
```

dump_sysinfo**:** Connect a USB flash via USB port at the rear of the system; use this command to dump the system information to USB device. If there is no USB device found, it will display the warning message.

```
console> dump_sysinfo
No USB found,please insert USB
```

diag**:** Print the diagnostic messages.

reboot: Reboot the system.

shutdown: Shutdown the system.

exit: Exit the console UI.

help: Display the help description.

©2015 Qsan Confidential. All rights reserved.

Glossary and Acronym List

Common Terminology

Item	Description
RAID	Redundant Array of Independent Disks. There are different RAID levels with different degree of data protection, data availability, and performance to host environment.
PD	The Physical Disk belongs to the member disk of one specific RAID group.
Pool	A collection of removable media. One pool consists of one or several RAID sets.
ZFS	ZFS is a combined file system and logical volume manager designed by Sun Microsystems. The features of ZFS include data integrity verification against data corruption modes, support for high storage capacities, integration of the concepts of file system and volume management, snapshots and copy-on-write clones, continuous integrity checking.
LUN	Logical Unit Number. A logical unit number (LUN) is a unique identifier which enables it to differentiate among separate devices (each one is a logical unit).
GUI	Graphic User Interface.
RO	Set the volume to be Read-Only.
DS	Dedicated Spare disks. The spare disks are only used by one specific RG. Others could not use these dedicated spare disks for any rebuilding purpose.
DG	DeGraded mode. Not all of the array's member disks are functioning, but the array is able to respond to application read and write requests to its virtual disks.
SCSI	Small Computer Systems Interface.
SAS	Serial Attached SCSI.
S.M.A.R.T.	Self-Monitoring Analysis and Reporting Technology.
WWN	World Wide Name.
HBA	Host Bus Adapter.
NIC	Network Interface Card.
BBM	Battery Backup Module

Data Service Terminology

Item	Description
CIFS	Common Internet File System. CIFS operates as an application-

©2015 Qsan Confidential. All rights reserved.

	layer network protocol mainly used for providing shared access to files, printers, serial ports, and miscellaneous communications between nodes on a network.
SMB	Server Message Block. Same as CIFS.
NFS	Network File System. NFS is a distributed file system protocol originally, allowing a user on a client computer to access files over a network in a manner similar to how local storage is accessed.
AFP	Apple Filing Protocol, formerly AppleTalk Filing Protocol. AFP is a proprietary network protocol that offers file services for Mac OS X and original Mac OS. In Mac OS X, AFP is one of several file services supported including Server Message Block (SMB), Network File System (NFS), File Transfer Protocol (FTP), and WebDAV. AFP currently supports Unicode file names, POSIX and access control list permissions, resource forks, named extended attributes, and advanced file locking. In Mac OS 9 and earlier, AFP was the primary protocol for file services.
FTP	File Transfer Protocol. FTP is a standard network protocol used to transfer files from one host or to another host over a TCP-based network, such as the Internet.
WebDAV	Web Distributed Authoring and Versioning. WebDAV is an extension of the Hypertext Transfer Protocol (HTTP) that facilitates collaboration between users in editing and managing documents and files stored on World Wide Web servers.
Deduplication	Data deduplication is a specialized data compression technique for eliminating duplicate copies of repeating data.
Thin Provisioning	Thin provisioning is the act of using virtualization technology to give the appearance of having more physical resources than are actually available. The term thin provisioning is applied to disk later in this article, but could refer to an allocation scheme for any resource.

iSCSI Terminology

Item	Description
iSCSI	Internet Small Computer Systems Interface.
LACP	Link Aggregation Control Protocol.
MPIO	Multi-Path Input/Output.
MC/S	Multiple Connections per Session
MTU	Maximum Transmission Unit.
CHAP	Challenge Handshake Authentication Protocol. An optional security mechanism to control access to an iSCSI storage system over the iSCSI data ports.
iSNS	Internet Storage Name Service.

©2015 Qsan Confidential. All rights reserved.